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NEW SOUTH WALES.

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VOL. XLIII. PART 1. JANUARY 1, 1932.

Agricultural Gazette of New South Wales.

Varieties of Wheat, Oats and Barley.

DEPARTMENTAL RECOMMENDATIONS FOR DIFFERENT DISTRICTS.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THE following are the latest recommendations as to the varieties of wheat, oats, and barley best suited to various portions of the State. Growers are advised to make early arrangements for supply of seed, and if in doubt as to which variety to sow they should communciate with the Department of Agriculture.

WHEAT.

Coastal Districts.

[Embracing districts which are specially subject to rust.]

For Hay—

Clarendon, Florence, Firbank, Gresley (early maturing varieties).

For Green Fodder—

Gresley, Florence, Firbank, Clarendon (early maturing varieties).

Sowing for hay should be made later than for green fodder.

Northern Tableland.

[Of which Glen Innes is representative.]

For Grain or Hay—

Cleveland (early sowing);
Nabawa (mid-season sowing);
Clarendon (mid-season and late sowing).

For Green Fodder—

Cleveland (early sowing);
Clarendon (early, mid-season and late sowing).

Central Tableland.

[Of which Bathurst is representative.]

For Grain or Hay—

Canimbla (early and mid-season sowing);
Cleveland (early and mid-season sowing);
Cadia (early and mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

Southern Tableland.

[Of which the Monaro, Crookwell and Batlow are representative.]

For Grain or Hay—

Cleveland (early sowing);
Yandilla King (early sowing);
Waratah (mid-season and late sowing);

South-western Slopes and Eastern Riverina.

[Of which Wagga, Temora, Wyalong and Barellan are representative.]

For Grain or Hay—

Yandilla King (early sowing);
Turvey (early sowing);
Marshall's No. 3 (early sowing, for more favoured districts);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Baroota Wonder (mid-season and late sowing).

For Grain only—

Union (early and mid-season sowing);
Federation (early and mid-season sowing).
Bebin (mid-season and late sowing).

For Grain on Mallee Soils—

Currawa (early sowing);
Penny (early sowing);
Nabawa (mid-season sowing).

For Hay only—

Zealand (early sowing);
Gresley (mid-season sowing).

South-western Plains and Western Riverina.

[Of which Deniliquin, Cargelligo and Hillston are representative.]

For Grain or Hay—

Nabawa (mid-season sowing);
Waratah (mid-season sowing);
Gresley (mid-season sowing).

For Grain only—

Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Bobin (mid-season sowing);
Canberra (mid-season and late sowing).

For Grain on Mallee Soils—

Currawa (early sowing);
Penny (early sowing);
Nabawa (mid-season sowing).

Central-western Slopes.

[Of which Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes and Parkes are representative.]

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Coonabarabran;
Canimbla (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Turvey (early and mid-season sowing);
Marshall's No. 3 (early and mid-season sowing);
Penny (early and mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

For Grain only—

Wandilla (early and mid-season sowing);
Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Bobin (mid-season sowing);
Duri (mid-season and late sowing).

North-western Slopes.

[Of which Tamworth and Gunnedah are representative.]

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Inverell and Delungra;
Currawa (early sowing);
Canimbla (early sowing);
Wandilla (early sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Clarendon (late sowing).

For Grain only—

Canberra (mid-season and late sowing);
Aussie (mid-season and late sowing);
Duri (mid-season and late sowing).

North-west Plains.

[Of which Coonamble is representative.]

For Grain or Hay—

Nabawa (early and mid-season sowing);
Canberra (mid-season and late sowing);
Florence (mid-season and late sowing);
Clarendon (early, mid-season and late sowing).

Western Plains.

[Of which Nyngan, Trangie and Condobolin are representative.]

For Grain or Hay—

Nabawa (early sowing);
Bobin (mid-season sowing);
Baroota Wonder (mid-season sowing);
Waratah (mid-season sowing);
Riverina (mid-season and late sowing).

For Hay only—

Firbank (early and mid-season sowing).

Murrumbidgee Irrigation Area.

For Grain or Hay on the Irrigated Areas—

Marshall's No. 3 (early sowing);
Yandilla King (early sowing);
Turvey (early sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

For Grain only on the Irrigated Areas—

Wandilla (early sowing);
Federation (early and mid-season sowing);
Union (early and mid-season sowing).

For Hay only on the Irrigated Areas—

Zealand (early sowing);
Gresley (mid-season and late sowing);

For Grain or Hay on the Dry Areas—

Yandilla King (early sowing);
Turvey (early sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Baroota Wonder (mid-season and late sowing)

For Grain only on the Dry Areas—

Union (early and mid-season sowing);
Federation (early and mid-season sowing).
Bobin (mid-season sowing).

For Hay only on the Dry Areas—

Gresley (mid-season sowing).

OATS.

Varieties Recommended.

The varieties recommended by the Department for the various portions of the State are as follows:—

North Coast.—Algerian (for grazing), Sunrise, Mulga, Buddah.
South Coast.—Algerian, Guyra, Sunrise, Mulga, Buddah.
Central Tableland.—Algerian, Guyra, Belar, Mulga.
Northern Tableland.—White Tartarian, Algerian, Guyra.
Southern Tableland.—Algerian, Guyra, Sunrise, Mulga, Buddah.
Monaro.—White Tartarian, Algerian, Mulga.
South-western Slopes and Riverina.—Algerian, Guyra, Belar, Mulga.
Central-western Slopes.—Algerian, Guyra, Belar, Mulga, Buddah.
North-western Slopes.—Algerian, Guyra, Belar, Sunrise, Mulga.
Under Irrigation.—Algerian, Guyra, Sunrise, Mulga.
Western Plains.—Sunrise, Gidgee, Mulga, Buddah.

BARLEY.

The varieties recommended by the Department are:—

Two-row type (commonly called "malting barleys").—Pryor.
Six-row type (commonly called "feed barleys").—Skinless for early winter green feed. Cape and Trabut for green fodder, and grain for stock in the cooler districts.

PURE SEED SUPPLY.

In each issue of this *Gazette* is published a list showing where pure seed of the various varieties recommended to farmers may be obtained. These supplies come either from the Department's experiment farms or from reliable farmers in different districts, who are concentrating on the selection and improvement of varieties, which are kept pure and maintained or improved in yielding capacity.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—	
Bald Early	Manager, Experiment Farm, Trangie.
Baroota Wonder	Manager, Experiment Farm, Trangie.
Bobin	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
Duri	Mr. M. Greenwood, Spring Ridge road, Quirindi.
Gresley	Manager, Wagga Experiment Farm, Bomen.
Nabawa	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
Union	Manager, Wagga Experiment Farm, Bomen.
Waratah	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
	Mr. R. M. Gelling, "Cooinoo," West Wyalong.
	Mr. Smith Pollock, "Glengarry," Quirindi.
Yandilla King	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
Zeeland	Manager, Wagga Experiment Farm, Bomen.
Oats—	
Algerian	Manager, Experiment Farm, Bathurst.
Belar	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Gidgee	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
Guyra	Manager, Experiment Farm, Bathurst.
	Manager, New England Experiment Farm, Glen Innes.
Mulga	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Recent tests in U.S.A. have shown that codliver oil loses much less vitamin A when it is kept out of the sunlight. It is preserved best when kept in amber-coloured bottles with just as little exposure to the air as possible.

Varieties of Oats in New South Wales.

A Morphological Basis for Their Identification.

ALLAN R. CALLAGHAN, D.Phil., B.Sc.(Oxon), B.Sc.Agr.

Introduction.

One of the outstanding features of recent agricultural development in the main wheat areas of New South Wales has been the remarkable increase in the appreciation by farmers of the value of the oat crop. This is very evident from the statistics for the decade 1917–27. During this period there was an

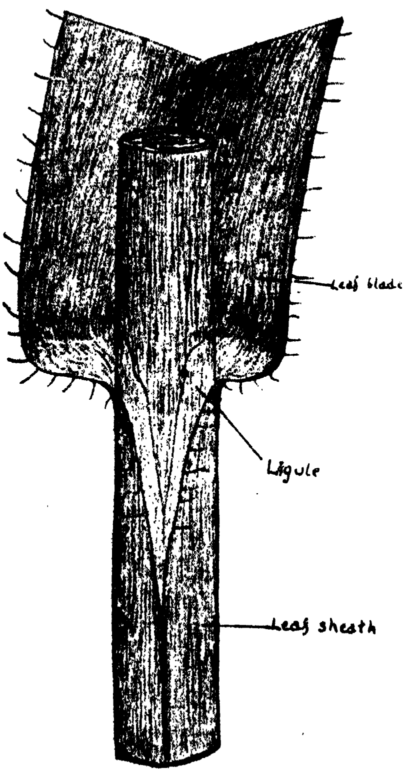


Fig. 1—The Base of the Leaf Blade and Portion of the Leaf Sheath of Gidgee.
Note the marginal hairs, and compare with Fig. 2.

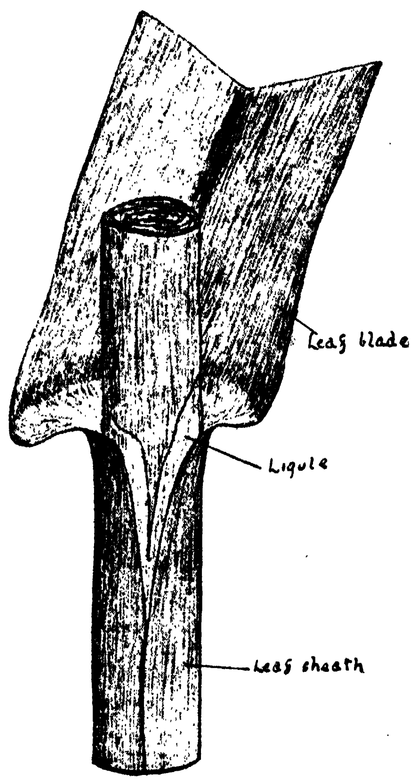


Fig. 2.—The Base of the Leaf Blade and Portion of the Leaf Sheath of Guyra.
Note its glabrous nature, and compare with Fig. 1.

increase of approximately 50 per cent. in the area devoted to oats in New South Wales. The greatest extension took place in the wheat areas of the State; for instance, in south-western districts and the Riverina there was a change from 88,925 to 228,178 acres, representing a 250 per cent. increase.

Oats command attention, not so much because of their market value as by reason of (*a*) their value as a rotation crop to combat the spread of wheat diseases, such as flag smut and take-all, to which they are immune; (*b*) their grazing potentialities; and (*c*) their usefulness in the conservation of fodder, whether it be in the form of hay, grain or silage. It is because of this versatility that they have been recognised as a profitable, as well as desirable, rotation, and for similar reasons their culture is rapidly becoming an integral part of farm practice in the wheat belt.

This cultural development would not have been possible had not the Department of Agriculture been successful in the early stages of its oat-breeding work, for, undoubtedly, the production of desirable varieties suitable for the drier short-seasoned districts of the wheat-belt has been fundamental. This work was begun by Mr. J. T. Pridham in 1904, and it is due to varieties evolved by him since then, more than to any other single factor, that oat growing has become popular, profitable, and economically sound under conditions such as prevail in the wheat country of New South Wales. The Plant Breeding Branch of the Department is still pursuing the work of breeding better and more suitable varieties to meet anticipated demands.

Farmers, particularly those who are pure seed growers, field officers, and seedsmen take a keen interest in oat varieties. Up to the present, however, there has been a lack of definite information with regard to the taxonomic or descriptive characters of the various varieties. Specific information appears to be urgently needed, as more confusion arises in connection with oat varieties than with those of other cereal crops. This is partly because the chief distinguishing characters of oats are masked from casual observation, and partly because the environment, defined by different cultural treatments, different soils, and different climatic conditions, has a very profound effect upon those characters which are normally observed. In addition, confusion is apt to arise from the appearance of aberrant seed types in a variety from varying conditions at harvest time giving rise to differences in colour of the grain (as a result of bleaching or immaturity), from mechanical admixture, or from synonymous names. It is hoped, therefore, that a full description, avoiding as far as possible terms of a technical nature, and stressing the salient points of difference of the various oats will prove of value to the general agricultural community of New South Wales.

At the outset it should be explained that this series of articles is not intended to be a botanical treatise on the classification and description of oat varieties, but it is intended rather to be a practical or economic account of the varieties grown in New South Wales, insofar as is necessary to distinguish them for commercial and practical purposes. The varieties have, however, been grouped under different species for scientific purposes, although the grouping here given departs from the usually accepted classification of our Australian varieties.

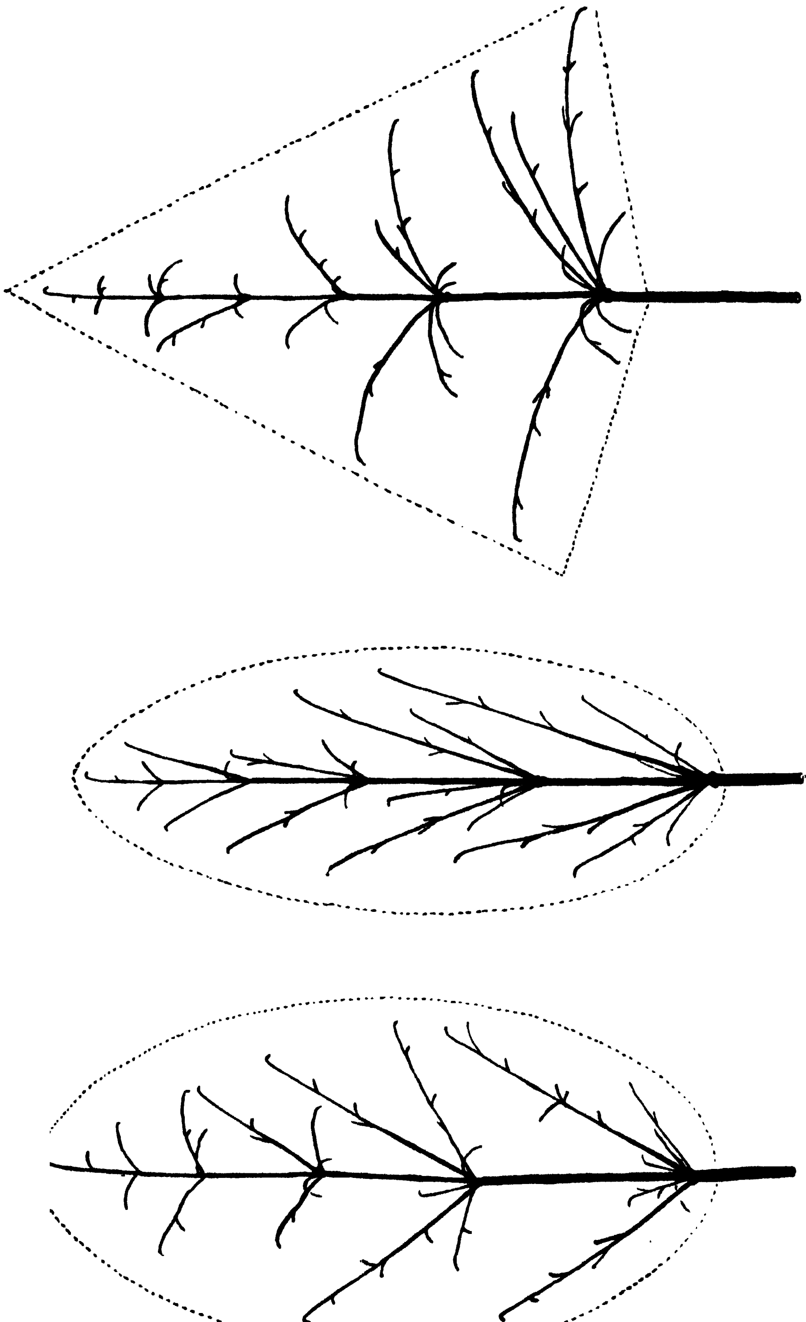


Fig. 3.—Diagrammatical Representations of the Three Panicle Types Referred to in the Text.

Left: Ovoidal panicle. *Centre:* Condensed Ovoidal panicle. *Right:* Pyramidal panicle.

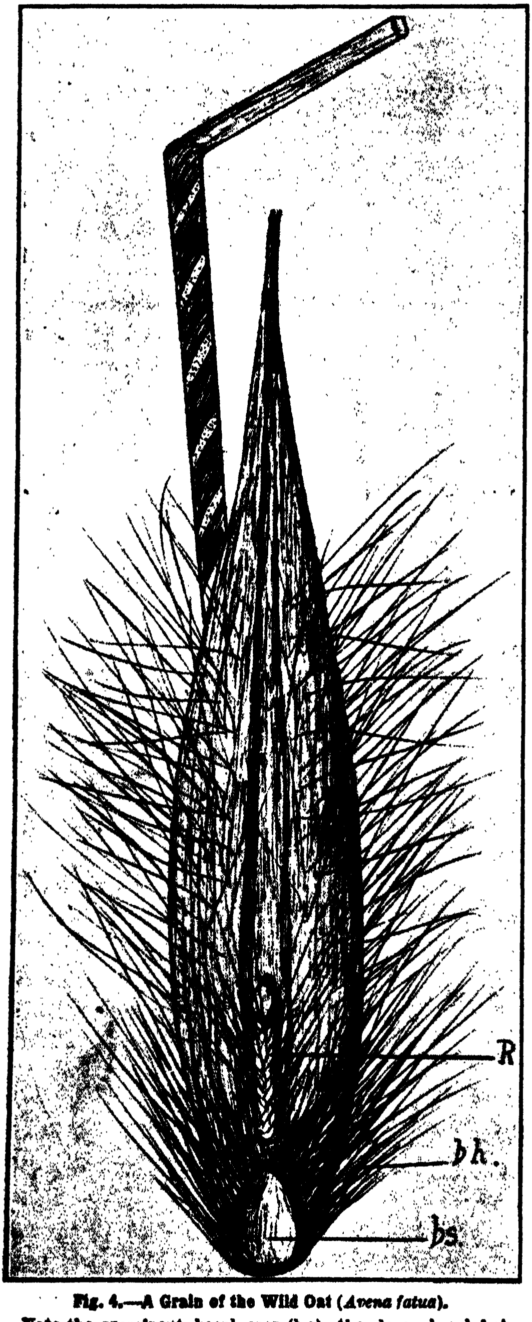


Fig. 4.—A Grain of the Wild Oat (*Avena fatua*).

Note the prominent basal scar (b s), the dense basal hair development (b h), and the hairy rachilla (R) with its spatula-shaped apex.

Before dealing with the varieties themselves a short account of the chief characters used in their description and identification is essential. Attention to detail cannot be over-emphasised, as many of our varieties, being closely related, are only distinguishable from one another by minute morphological differences which might quite easily be overlooked. In some cases it is difficult to define the differences with any degree of sharpness, and whilst the descriptions may prove satisfactory to plant breeders and others who are conversant with the distinctions, and have means of direct comparison, the farmer who is in doubt as to the correct name of a variety is advised to forward samples for identification.

Morphological Basis.

The characteristics of greatest importance in the separation of oat varieties concern the grain itself, but, as in any other group of plants, a thorough general knowledge of the habit of the plant and its appearance during all phases of its growth is of great significance. A close acquaintanceship with varieties grown side by side, under strictly

comparable conditions throughout their entire growth, is of inestimable value, and much of the so-called wizard-like recognition of varieties is nothing more than a spontaneous association of certain definite and possibly some indefinable characters with the varieties in question. For this reason every portion of the above-ground parts of the plant should receive careful study.

Early Habit.—During early development, oats, like other small-grain cereals, show certain definite growth forms. The young plants may be (*a*) erect, as in the case of Buddah, (*b*) semi-erect, like Guyra, or they may be (*c*) prostrate, as in Algerian, for example. The particular habit of growth of any variety is constant under similar conditions of culture.

Tillering.—Habit of growth is correlated with stooling capacity; those varieties which are prostrate in early growth normally tiller more extensively than do the semi-erect or erect types. Stooling ability as a morphological character, however, does not help very much to separate one variety from another. It is of so arbitrary a nature and so variable under different conditions of culture that its taxonomic value is nullified. In the description of varieties, however, it is important, and a system of points, namely, 1 to 5. is followed in that connection.

The Stems or Straw.—Some varieties show marked differences in height of straw; a good contrast is afforded in this regard by Algerian (tall) and Palestine (short). For descriptive purposes the terms tall, medium-tall, medium-short and short are used. The straw also varies in strength and texture; it may be weak, medium-strong or strong, coarse, medium-coarse, medium-fine or fine. The nodes of the stems are sometimes covered with fine hairs, as in Gidgee, but in most cases they are quite smooth (glabrous), A slight to very decided purple colouration of the stems is often noted; it is accompanied as a rule by a similar colouration of the leaf-sheaths. In the young growth of the plant the leaf-sheaths are often a very deep purple. Many of our varieties possess this colour factor in the stems and leaf-sheaths to a very marked degree, but it is of less frequent occurrence in oats of the *Avena sativa* species (English oats).

The Leaves.—Breadth of leaf and its depth of green are also varietal. Palestine, for instance, has much broader foliage than Algerian, in which variety it is notably narrow. Fulghum has a light green foliage which contrasts sharply with the dark green of Guyra. The margin of the leaf-blade is often fringed with fine hairs, while in other varieties it is glabrous. Fig. 1 illustrates the hair-fringed margin of the leaf-blade of Gidgee, whilst the companion Fig. 2 shows the base of the leaf-blade of Guyra, which, by way of contrast, is glabrous. A similar difference is noticeable in the leaf-sheaths; in some varieties they are quite glabrous (smooth), in others they are pubescent (hairy).

The Panicle.—Some workers have laid great stress on variations in the panicle as aids to classification. The only very decided difference in panicle formation of the New South Wales oats lies between the unilateral, or

one-sided type, and the equilaterial, or so-called tree type. In the latter group, however, it is possible to distinguish between the truly pyramid-shaped panicle and the ovoidal panicle. These shapes are controlled chiefly by the angle at which the branches arise from the main panicle stalk (rachis), and by the closeness of the nodes of the rachis. The figures illustrating the various oats, together with the diagrammatical representations in Fig. 3, will make these points clearer. In the descriptions the nature of the panicle branching is described as erect or drooping, and the general contour of the panicle as pyramidal, ovoidal or condensed-ovoidal. In addition to these characters the rachis (or main stalk of the panicle) may be erect or drooping.

The Spikelets.—The arrangement of the spikelets on the panicle makes a big difference to the general density, and in most oats the spikelets hang down gracefully in the one plane (they are pectinate). In a few cases the spikelets are faced in slightly different directions, which makes a remarkable difference to the appearance of the oat. Burke is a variety with the latter character (confused spikelets), and it is this feature that gives oats of this class a distinct "shivery-grass" appearance. The number of grains per spikelet is seldom constant, and can rarely be used with any confidence, except for descriptive purposes. The spikelets may be large, medium-large or small, characters which are controlled largely by the size of the grains. In recording descriptions the number of so-called "nerves" (vascular bundles) of the outer-glumes should be taken into account.

The Grain.—With regard to the actual grain characters a great deal might be written and a large field of literature reviewed. However, only fundamental points will be dealt with here in order to show the expediency or otherwise of noting any particular character.

The *shape* of the grain may act as a supplementary index to any given variety, but fine distinctions are misleading and should be avoided. Generally speaking, the oats of *sterilis* or part

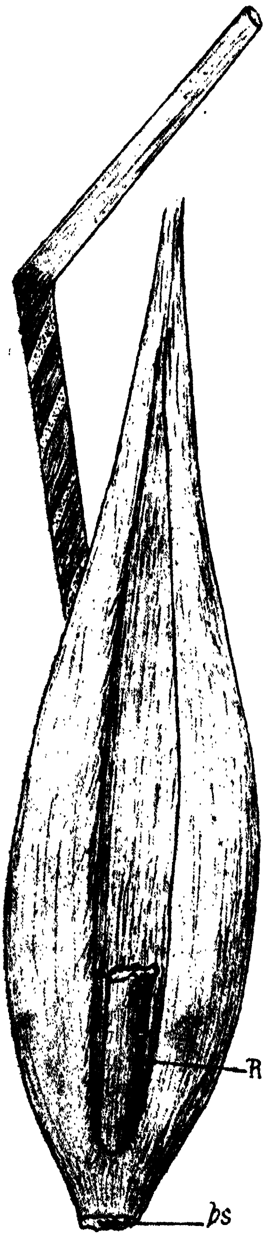


Fig. 5.—A Grain of White Ligowo (*A. sativa*), of the English Oat Group.

Note the solidified base (b s) and the rachilla (R) with its joint-like apex.

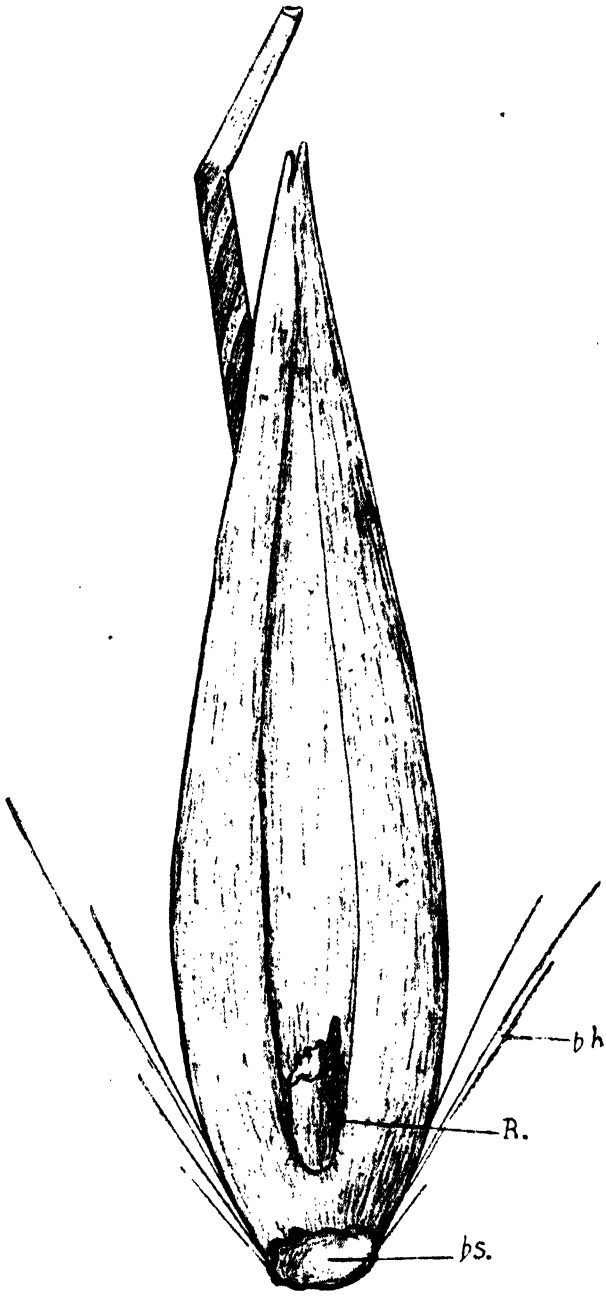


Fig. 6.—A Grain of Lachlan Oats (*A. sterilis culta*), Representing the Class to which a Great Many Australian Oats Belong.

Note the scanty development of the basal hairs (b h), the fractured rachilla (R), and the intermediate character of the basal scar (b s).

sterilis origin are fairly long and narrow, and are classed as fusiform; those of the English type (*Avena sativa*) are shorter and rounder, varying between oviform and coniform.

The *colour* of the grain is one of the most conspicuous varietal characters. It is expressed in the grain-husk and varies through a great number of shades, from black or dark brown to white; black, dun, dark brown, light brown, yellow, cream and white are used in the descriptions. The colour may vary appreciably from season to season under the control of different environmental factors, but, generally speaking, the colour of any variety will never fluctuate to such an extent as to be mistaken for any other colour. The weather conditions during ripening and later during harvest, and the degree of maturity, have an effect upon the brightness or the shade of colour. It has been noted that badly rusted plants produce grains of a lighter shade than normal, the rust preventing complete maturation of plump grain. Cool climates favour the expression of true colour, the tone being darker than that of the same variety grown in warmer zones. In this regard the sun's rays are known in Australia to have a bleaching effect almost as potent as wet conditions during harvest. Some varieties show a peculiar colouration of the palea or under-surface of the grain, which, though normally of the same colour as the remainder of the grain, is in the cases referred to a light dun or dark brown, and often of mottled appearance.

Fig. 7.—Diagram of a Spikelet of Algerian Oats (*A. byzantina*), Showing Weak Awns on both the First and Second Grains.

The structures of the *base of the grain* and of the *rachilla* are of considerable systematic importance, and are the leading features involving wide distinctions. The basal scar pertains to the primary grain of the spikelet, while the rachilla, being the floral axis of the spikelet, connects the second grain with the first and is left either wholly or partially attached to it when the grains are separated. Thus the primary, or first grain of the spikelet, which is the larger, serves as the subject of study for characters relevant to the basal scar and rachilla.

In the wild oat of the species *A. fatua* the basal scar is enlarged into a horse-shoe shaped callosity surrounded by a rim of hard horn-like tissue, the whole structure being referred to appropriately as the sucker-mouth. The rachilla structure of the common wild oat is likewise conspicuous and quite typical, bearing at its summit a spatula-shaped surface, signifying its ready articulation with the secondary grain. Both these features favour exceedingly easy disarticulation, so that the spikelet falls from the panicle, and the seeds fall apart at the slightest provocation. The characters referred to are illustrated in Fig. 4. The *A. sterilis* wild oat possesses a basal scar

1. 2. 3.

[Fig. 8.—Diagrammatical Representations of the Three Classes of Awns in Oats.

(1) Strong awn with its dark twisted base and definite geniculate bend, *e.g.*, Guyra. (2) Intermediate awn with dark and twisted base but no decided knee bend, *e.g.*, Fulghum. (3) Weak awn, *e.g.*, Kareela.

favouring loose disjunction as in *A. fatua*, but the rachilla character is just the opposite, and all grains of the spikelet are tenaciously held together, fracture of the rachilla being necessary to separate them.

In the English oats of the *A. sativa* species no basal callosity is present; the base narrows down to a minimum, and fracture of this slender junction is necessary before the spikelet can be removed from the panicle. The base in this instance is said to be solidified, and a distinct surface of fracture can be readily seen with the aid of a hand-lens. The second grain, however, is

less firmly attached and the rachilla in these forms show a small knob at its summit and a surface indicating free articulation with the base of the secondary grain. The solidified base and rachilla character of this group are illustrated in Fig. 5.

Still another group exists, and to this belong the leading varieties of the State. The basal scar is neither well developed like the wild oat nor definitely solidified like the English oat. In fact, it is somewhat intermediate, but in all cases the spikelet may be freely disjoined from the panicle, and a surface indicating this comparative freedom of articulation is present. The rachilla character may at first seem confusing, but normally it shows marks of fracture, in some cases near its summit; in other instances evident breaks occur in the middle or low down near its union with the base of the first grain. This intermediate type of basal scar and the fracturing rachilla is shown in Fig. 6.

The wild species are endowed with a nature characteristically hairy, and in these the rim of the basal scar is fringed with long and abundant basal hairs. Various expressions of the latter occur in our varieties, but so few and sparse are they in some sorts, as in Mulga and Guyra, that they are seldom noticed by the average observer. To detect these hairs, therefore, it is of extreme importance to take the grains from the panicle by hand. Their presence or absence, as the case may be, is a constant phenomenon of any particular variety. They may be abundant or few, short or long, or entirely absent.

The *awn* in our varieties is, speaking generally, second to grain colour in conspicuousness, and for sound judgment in the identification of varieties it should be given the closest attention. Many and varied uses have been made of the diverse expressions of the character of the awns for purposes of classification, but to review the literature on the subject would not serve the present purpose. From the viewpoint of the varieties being dealt with here the awns can be used to advantage for purposes of distinguishing between secondary groups of varieties. In some sorts, such as Algerian and Palestine, the secondary grain bears an awn as well as the first grain (see Fig. 7); this enables varieties of this class to be grouped in a separate category from those that carry an awn on the primary grain only. In the latter case a strong awn is defined as such if it possesses a definite knee-bend or geniculation, separating it into a basal and an upper portion. The basal portion is darkly pigmented and twisted spirally in a dextrose or clockwise fashion. (See Fig. 8 (1)). An intermediate awn shows the same twisted and darkened basal section, but to a lesser degree, and no knee or geniculate bend is definitely manifest. (See Fig. 8 (2)). Weak awns are fine and have neither the twisted dark base nor the bend as shown in (3) of Fig. 8. Furthermore, in some varieties all spikelets of the panicle bear awns, in others only a few, whilst some varieties possess so few awns that they may be referred to as

awnless. It is well to note here also that the character of the awn should only be studied on spikelets that have been plucked from the panicle by hand.

Other characters might be incorporated for the benefit of detailed botanical descriptions, such as the number of "nerves" in the flowering glume (lemma), and details of the rachilla, but as these serve no immediate purpose in the matter of distinguishing the varieties dealt with here, they are omitted in order to preserve clarity of presentation.

(*To be continued.*)

Tomato Variety Trials at Bathurst, 1930–31.

Trials to ascertain the best varieties for growing under irrigation on the rich alluvial flats in the Bathurst district and also on the poorer upland granite soils without irrigation were continued last season at Bathurst Experiment Farm.

All varieties made good growth until February, 1931, when a dry spell administered a severe set-back to the unirrigated upland trial. resulting in a marked reduction in yield. In other respects the season was comparatively mild.

The following table of yields and the accompanying comments are culled from the report of Mr. G. T. Dawson, Experimentalist:—

Variety.	Alluvial Soil (irrigated).			Upland Soil (not irrigated).		
	t.	c.	q.	t.	c.	q.
Bonny Best (selection) ...	8	16	2	4	6	3
Marvel of the Market ...	7	17	3	4	6	0½
Rapid Red	7	5	3	3	14	3
Bendigo Large Red ...	7	1	1	4	6	3½
Bonny Best (standard) ...	6	10	3	3	14	0½
Columbia	6	5	1	3	10	0½
Norton (Missouri) ...	5	12	0	3	8	0
Marglobe (Bathurst Experiment Farm) ...	5	8	1	3	16	0½
Norton No. 2	4	15	1	4	0	3½
Marglobe (Missouri) ...	4	12	3	4	16	2½
Marglobe (U.S.A.) ...	4	8	3		...	
Australian Large Red ...	4	1	3	4	7	0

While previous trials have emphasised the value of the standard variety Bonny Best as an all-round variety for the Bathurst district, it did not show to advantage under the conditions prevailing last season. On the alluvial soil the earlier maturing selection of Bonny Best gave the highest yield, but the fruit of this selection was too small in both trials to be marketable in the fresh state, and consequently it cannot be recommended in preference to the standard variety.

As a general rule the incidence of early frosts in this district reduces the yields of late varieties of tomatoes, such as Marglobe and Norton, and therefore these cannot be recommended for yield in preference to earlier varieties such as Bonny Best, Rapid Red, Bendigo Large Red, etc. The early frosts experienced under upland conditions were very light last year, hence nearly full yields of the later varieties, such as Marglobe (Missouri), Marvel of the Market were harvested, which is not generally possible in the Bathurst district, where the cropping period is so limited.

Rice Experiments, 1930-31.

YANCO RICE RESEARCH STATION.

F. MATTHEWS, H.D.A., Officer-in-Charge.

PERHAPS not since the inception of rice growing on the Murrumbidgee Irrigation Area has a more unfavorable season been met with than that of 1930–31. Low temperatures at sowing, accompanied by one of the coolest summers on record, and heavy and continuous autumn and winter rains which set in in March, all militated against high ultimate yields and low costs of production.

Conditions at the Rice Research Station were, if anything, worse than those met with on the great bulk of the rice-growing land, and the black, self-mulching soil, which dries slowly, made it practically impossible to harvest until very late in the season. Although good results may be obtained when an early summer favours a good strike from an early sowing, and this is followed by a comparatively dry winter, it is now evident (from experience over a period of years) that rice is grown under a very severe handicap on this type of soil. The experiments point to the fact that the black soil is not sufficiently warm to ensure maximum germination until at least the middle of October, and fully a month longer must elapse after draining before harvesting can commence as compared with the average soil on which rice is grown.

A Drainage Experiment.

Plots were sown on new land which was fine, free from weeds, and well consolidated. Sowing took place on 28th October at the rate of 100 lb. of seed per acre.

The yields were as follows :—

Treatment.	Yield. 1929–30.	Yield. 1930–31.
	t. c. q.	t. c. q.
Drained in two days; half dough stage	1 11 2	1 18 3
Drained in full dough stage—two days	1 12 1	1 15 3
Water evaporated; half head in dough stage	1 5 1	1 13 3
*Drained in fourteen days; crop yellow	1 11 3	....
Drained in two days; quarter dough stage	....	1 9 2

* Owing to the fact that an old channel which was filled recently ran through this bay and caused considerable unevenness in growth, it was impossible to take the yield from this plot.

All samples were accepted as A Grade. On this heavy type of soil there is no necessity to await full dough stage before draining. It takes fully a

month from drainage before the land will carry implements, and the moisture in the soil is sufficient to mature the lower grains. With the evaporation method, if 8 inches or more of water is held, draining could be stopped at quarter dough stage and the remaining water drained off between half and full dough stage. However, the big drop in yield, due to many empty heads, of the bay drained at quarter dough stage would tend to show that the depth of water is still essential until after this stage has been passed.

The Fertiliser Trial.

This trial (for the first time) was carried out on land which had already grown rice, the rotation being rice, fallow, rice. The land was ploughed deeply in September, 1929, after rice to get rid of cumbungi, which had made its appearance with the preceding crop, let lie until March, 1930, and then worked twice with the duckfoot cultivator. It was disc cultivated 2 inches in October, smoothed and sown with 130 lb. graded seed per acre. The seed-bed was fine, and free from weeds and well charged with moisture at a depth of 2 inches, at which level the seed was sown. All bays, with the exception of the complete manure bay and that treated with 2 cwt. sulphate of ammonia and 1 cwt. sulphate of potash, which were sown after rain which caused a break in the sowing of the experiment, germinated well.

There was no difference in heading dates, but the bays dressed with sulphate of ammonia ripened a week later than the no manure bay: that is, they had practically the same maturity as rice sown on virgin ground. The sulphate of ammonia bays were bulkier, the 3 cwt. application growing a very rank crop, which, however, failed to fill satisfactorily. There was a big loss in yield from all plots, the crops having to stand for a considerable time after ripening before harvesting could take place.

The following were the acre yields :—

Treatment.	Yield.	
	1929–30.	1930–31.
	t. c. q.	t. c. q.
2 cwt. sulphate of ammonia	1 12 1	1 15 0
1 cwt. sulphate of potash and 2 cwt. superphosphate ...	1 9 2	1 12 3
2 cwt. sulphate of ammonia and 2 cwt. superphosphate ...	1 12 0	1 12 1
2 cwt. sulphate of ammonia, 2 cwt superphosphate, and 1 cwt. sulphate of potash	1 16 0	1 11 2
3 cwt. sulphate of ammonia	....	1 10 3
2 cwt. sulphate of ammonia and 1 cwt. sulphate of potash...	1 14 3	1 9 2
No manure	1 8 0	1 2 0

The comparatively low yield obtained from the complete manure bay and the 2 cwt. sulphate of ammonia and 1 cwt. sulphate of potash plot may be traced directly to the poorer germination.

Methods of Sowing.

Three bays, each of 2 acres, were used for a method of sowing trial which was carried out on new land which was treated culturally in a similar manner to the variety trial.

The plots were as follows :—(1) Rice sown 1 inch deep, watered and drained till 4 inches high, then submerged; (2) rice sown 1 inch deep, watered once, submerged on appearance of rice; (3) rice sown on surface and flooded to depth of 8 inches, and maintained.

The yields were as follows :—

Treatment.	Yield. 1929-30.	Yield. 1930-31.
	t. c. q.	t. c. q.
Drilled; submerged on appearance of rice	1 16 3	1 18 0
Drilled; watered as required till 4 inches high, then submerged	1 15 0	1 15 0
Broadcast; flooded 8 inches immediately	0 19 3	1 3 3

Plot 2 gave the highest yield, and putting the water on with the appearance of the rice meant a saving of approximately 1 foot of water per acre on this type of soil as compared with the treatment adopted with Plot 1. Plot 3 germinated well, but, as in past years, the bulk of the seedlings were washed out by water movement before the root system became established. This coming year rolling will be carried out in an effort to consolidate the soil around the seed without covering. There was little to choose in appearance between Plots 1 and 2, but Plot 2 commenced to head two days before Plot 1.

Plot 2 was also sown in three other bays, the depth and method of covering the seed being varied. The yields in this trial were as follows :—

Treatment.	Yield.
	t. c. q.
Seed covered with chain	1 17 0
Seed drilled 1 inch deep	1 17 0
Seed drilled 1½ to 2 inches deep	1 13 2

Time-of-Sowing Experiment.

This trial was sown on reddish-brown self-mulching soil ploughed in March, twice graded, harrowed in June and worked with a duckfoot cultivator in September. This sowing was, therefore, carried out on a well-prepared fallow with moisture 1½ inches below the dry mulch. The rice, sown at 110 lb. per acre, germinated splendidly and was submerged as soon as the grain shot, first just covering the ground and then gradually increasing until in the latter part of the season a depth of 12 inches of water was held on these bays.

The yields were as follows :—

Date Sown.	Yield. 1929–30.	Yield. 1930–31.
	t. c. q.	t. c. q.
1 October	1 18 0	*
15 October	2 6 1	2 0 0
1 November	2 0 2	1 18 1

* An old channel filled in which ran through bays sown on 1st October and 15th November made it impossible to take the results from these plots. Results and observations have shown, however, that there is no advantage from sowing before October with this heavy class of land.

A Variety Trial.

Trials were carried out with Caloro 46, Colusa 180, Lady Wright, and Texas Prolific in acre bays. Although bays adjoining each other were selected, and they were treated as evenly as possible as regards depth of water, it would appear that this method of testing varieties leaves too great a margin of probable error, and in future these trials will be carried out in drill widths using Caloro 46 as a check.

The long-grained types did not stool to nearly the same extent as Caloro, and it would seem that a sowing of up to 150 lb. of seed per acre against the accepted 100 lb. for Caloro might not be too heavy. Grains per bushel show to the extent of 3 per cent. in favour of the short-grained types, and germination tests with the seed used also showed a slightly better result with the short grain. The plots were sown on 20th October, 1930. The results were as follows :—

Variety.	Date Headed.	Yield.
		t. c. q.
Caloro 46 (short grain)	17 February, 1931	2 0 0
Colusa 180 (short grain)	12 February, 1931	1 18 0
Texas Prolific (long grain)	*14 February, 1931	1 3 2
Lady Wright (long grain)	12 February, 1931	1 1 2

* Although isolated heads of Texas Prolific showed on the date mentioned, the bulk of the plants were at least a week later.

Rate-of-Seeding Trial.

This was carried out in two sections on black, self-mulching, new land, as follows :—Section 1.—Seed germinated in moist seed-bed, then water applied. Section 2.—Seed sown and then germinated by watering and draining.

The land was ploughed in March, twice graded, harrowed in June and worked with the duckfoot cultivator in September. Plots in Section 1 were sown 2 inches deep to moisture, and those in Section 2 were sown on the surface and covered with the chain harrow. It was found that the plots in Section 1 should have been rolled after sowing to consolidate the soil around the grain.

Germination was good in all bays with the exception of the 125 lb. and 150 lb. sowings in Section 1 which were sown after rain, and the soil, not being compacted, dried away from the grain to some extent. The yields were as follows :—

	Seed per acre.	Yield per acre. t. c. q.
Section 1.	(Watered after germination.)	
	100 lb.	2 5 0
	75 lb.	2 1 2
	125 lb.	1 16 1
	150 lb.	1 8 0
Section 2.	(Watered after sowing.)	
	125 lb.	2 4 2
	100 lb.	2 1 2
	75 lb.	2 0 1
	150 lb.	1 19 2

Disregarding the 125 lb. and 150 lb. plots in Section 1, it would appear that the germination obtained is not quite as good where water is applied to germinate, as it is where it is possible to germinate either through the moisture in the soil or by means of rainfall. This would doubtless be accounted for by the fact that the soil must become colder where a body of water is applied early in the year.

Apparently on this heavy type of soil, between 100 lb. and 125 lb. of seed is required on new land to obtain the optimum strike. The possibilities are that this amount will have to be increased with old land.

Miscellaneous Trials.

Another small trial was carried out with seed-bed preparation. The results were as follows :—

	t. c. q.
Seed sown on fine bed	2 5 2 per acre.
Seed sown on rough ground	1 16 1 per acre.

The strike was very uneven on the rough ground owing to the grain being sown anything from on the surface up to 3 inches deep.

A bay was also sown on 12th March to see if rice would live through the winter and thus ripen earlier. Frosts in August killed out most of the plants, and weed growth smothered the balance.

Carrot Varieties for the Bathurst District.

Carrot varieties have been under trial for the last two years at Bathurst Experiment Farm, and although Chantenay has yielded best on both occasions, it cannot be recommended in preference to St. Valery Intermediate, which produces a much more uniform and better quality carrot. Manchester Table, the other variety under trial, has proved unsuitable for the Bathurst district, the roots being coarse and of poor quality, while the yield is considerably less than that of the other two varieties.

Pasture Improvement Competition at Dapto, 1931.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

A PASTURE improvement competition was conducted by Dapto A. and H. Society this year and attracted seven entries. The aim of the competition, as in the case of that carried out in 1930, was the improvement of the carrying capacity of the pastures, and no restriction was placed on the methods employed. It was stipulated, however, that land ploughed or ploughed and sown to grass during the previous three years was ineligible.

The points scored by the leading competitors are as follows:—

Competitor.	Palatability and feeding value. (Max. 20 points.)	Presence of clovers and other legumes. (Max. 20 points.)	Freedom from weeds and diseases. (Max. 10 points.)	Management. (Max. 10 points.)	Improvement in carrying capacity. (Max. 40 points.)	Total.
E. T. Evans, "Penrose," Dapto	20	18	7	8	28	81
J. A. Armstrong, "Avondale," Dapto	16	18	8	8	29	79
C. Brown, "Wollingurry," Yallah	16	18	8	8	27	77
Marshall Bros., "Daisybank," Dapto	16	16	8	8	25	73

The pasture entered by Mr. Evans contained an excellent mixture of pasture plants, the most prominent being paspalum, perennial rye grass, prairie grass, Kentucky blue grass, white clover, subterranean clover, and suckling clover. The area was top-dressed on 23rd June with 1½ cwt. superphosphate per acre, and showed considerable benefit from the application.

All competitors top-dressed with superphosphate, and although the quantities used per acre varied considerably and the seasonal conditions during the spring were very dry, a good response was apparent at each centre. The paddocks entered in the competition all showed to advantage when compared with untreated, heavily grazed paddocks, thus demonstrating the value of small paddocks rotationally grazed and given definite periods of rest between grazings.

Competitors in this competition appeared to be cognisant of the value of pasture top-dressing, but would be well advised to consider the advantages of using a renovator. Although ordinary harrows had been used in the paddocks a few times, this was the only mechanical treatment given and was obviously insufficient. Paspalum pastures require drastic treatment with a renovator (working about 3 inches deep) to ameliorate the sod-bound condition of the grass and stimulate growth. Renovation

improves the aeration and water absorption power of the soil as well as overcoming the root-bound condition of the grass, and best results cannot be expected from top-dressing paspalum until this work has been carried out. This work should be done in the autumn. Competitors and dairy-farmers in general are urged to give this phase of pasture improvement the attention it deserves.

SUBMISSION OF CLAIMS UNDER THE WHEAT BOUNTY ACT.

THE method to be adopted in submitting claims for bounty under the Wheat Bounty Act is as follows:—

Forms of claim for bounty will be obtained by pools, merchants, millers and other receivers of wheat, including country millers and traders, direct from the Officer-in-charge, Wheat Bounty Section, in the respective States, and transmitted to growers. Application forms are now obtainable for distribution, and estimates of requirements should accompany applications for forms. Mr. L. Rowling, 5th Floor, Commonwealth Savings Bank Buildings, 32 Castlereagh-street, Sydney, is the officer-in-charge of the New South Wales Wheat Bounty Section.

Except in the case of country millers and other country traders in wheat, claims must be forwarded by growers after the completion of particulars required from them to the head office of the firm or organisation to which they have delivered the wheat. The firm or organisation, after completion of the relevant certificates, will forward claims to the Officer-in-Charge, Wheat Bounty Section, for subsequent action.

Country millers and other country traders will, after certifying as to the correctness of quantity of wheat shown, send applications to the Officer-in-Charge, Wheat Bounty Section.

After such departmental check as may be necessary, payments of bounty will be effected by cheque direct to the grower.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Dapto (E. G. Coghlan) ...	... Jan. 8, 9
Albion Park (H. H. Beattie) ...	„ 15, 16
Wollongong (V. Stumbles) ...	„ 21, 22, 23
Kiama (G. Somerville) ...	„ 26, 27
Kangaroo Valley (L. W. Vance)	„ 19, 20
St. Mary's (T. Green) ...	„ 30
Berry (Geo. Gillam) ...	... Feb. 5, 6
Nowra (R. King) ...	„ 11, 12, 13
Pambula (L. K. Longhurst) ...	„ 12, 13
Milton (G. Prior) ...	„ 17, 18
Bega (A. O. Manns) ...	„ 24, 25
Uralla (D. G. Evans) ...	„ 24, 25
Newcastle (P. G. Legoe) ...	„ 24 to 27
Gunning (G. E. Ardill) ...	„ 25, 26, 27
Robertson (W. G. Jenkin) ...	„ 26, 27
Campbelltown (R. A. Sidman)...	„ 26, 27
Tumut (Milton Archer) ...	... Mar. 1, 2
Taralga (W. N. Fitzgibbons) ...	„ 1, 2
Mudgee (T. P. Gallagher) ...	„ 1, 2, 3
Cooma (G. E. Metcalfe) ...	„ 2, 3
Dorrigo (A. C. Newman) ...	„ 2, 3
Maitland (M. A. Brown)	... March 2 to 5
Oberon (F. H. Kelly) ...	„ 3, 4
Moss Vale (H. Richardson) ...	„ 3, 4, 5
Gundagai (W. J. Sullivan) ...	„ 8, 9
Dungog (W. H. Green) ...	„ 9, 10, 11
Camden (G. V. Sidman) ...	„ 10, 11, 12
Goulburn (T. Higgins) ...	„ 10, 11, 12
Bowral (E. Waine) ...	„ 11, 12
Gunnedah (M. G. Tweedie) ...	„ 15, 16
Crookwell (A. G. McDonald) ...	„ 17, 18, 19
Sydney Royal (G. C. Somerville)	„ 21 to 30
Kempsey (E. E. Mitchell)	... April 6, 7, 8
Taree (C. A. Jackson) ...	„ 7, 8, 9
Wingham (C. H. Blenkin) ...	„ 13, 14
Grafton (L. C. Lawson) ...	„ 13 to 16
Maclean (T. B. Notley) ...	„ 20, 21
Macksville (P. R. Larkey) ...	„ 26, 27
Casino (E. J. Pollock) ...	„ 27, 28, 29
Gresford (A. R. Brown) ...	„ 29, 30
Berrigan (R. Wardrop)...	... Sept. 28
Narrandera (J. D. Newth)	... Oct. 4, 5

Pasture Improvement and Management at Bodalla.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

No centre on the coast of New South Wales has made more progress in the matter of pasture improvement, top-dressing, and general grassland management than Bodalla. This district is ideally suited by its richness of soil, climatic conditions and topography to follow the excellent example set by the dairy-farmers of New Zealand. It is regrettable that similar attempts at pasture improvement work are not essayed by dairy-farmers in other districts on the far South Coast; maybe the quality of the land is not up to the standard of the Bodalla flats, but, on the other hand, the initial cost was less, and therefore the farmer can afford to spend more to bring about improvement.

Friesians Grazing on Improved Pastures on Mr. A. F. Emmott's Farm.

The contention is made by many that the highest-priced, and, presumably, the richest land, does not require treatment to improve it. This is quite incorrect, as it is much more profitable to expend money on the improvement of a good article than to rejuvenate one that has almost reached the discard. Twenty shillings outlay to improve £100-per-acre land represents only 1 per cent.; the same outlay to improve £3-per-acre land represents 33 per cent., and there has to be a big improvement in the latter proposition to make such expenditure warrantable. By this it is not meant to infer that the poorer hill-land does not pay to improve: on the contrary it does, but on all farms the better-quality land and pasture should be the

first on which attempts at improvement should be made, be it sowing with better grasses and clovers, subdivision of paddocks, harrowing of pastures or top-dressing with fertilisers.

Climate, Soils and Pastures of the Bodalla District.

Bodalla is situated within 1 to 3 miles of the coast and has a height above sea-level of 40 feet. The climate is temperate, with the summer comparatively mild, although on one occasion a temperature of 108 degrees was recorded. The winters are also comparatively mild, with cold conditions more intensified on the flats. The Tuross River, which rises in the mountainous country to the west, flows through the majority of the farms and thus assures a satisfactory water supply for stock.

The average rainfall is 35 inches, the months of heaviest incidence being December to March, which have an average total, recorded over a period of fifty years, of over 3 inches, the average for the remaining months over this same period being over 2 inches. The driest period is experienced during the late winter and early spring, but it is only in occasional seasons that this period might be termed droughty.

The soil on the flats is a good quality alluvial, varying in quality to a certain extent as a result of its position of deposition. Certain areas are rather sandy, but these are considerably in the minority. The hill-land is in the main very poor, uncleared, and with a carrying capacity of about one beast to 40 or 50 acres.

The pastures on the flats are composed mostly of Perennial Rye, Cocksfoot, Prairie grass, Paspalum and White clover. From this it will be observed that there is an excellent sole on which to work.

Results Obtained by Mr. A. F. Emmott, "Home Farm," Bodalla.

This farmer's experience will suffice to show what is possible by a thoroughly carried out system of grassland management. Mr. Emmott's property is situated on some of the best alluvial flats at Bodalla, but the hill-land, of which there are many acres, is practically valueless, and at no time do his milch cows have access to it. The area of alluvial land is 130 acres, this area two years ago being subdivided into nine paddocks. At the present time there are twenty-two paddocks, the majority with an area of 5 acres each. This subdivision of the property into small controllable paddocks is the first essential of a thorough system of pasture improvement, and can be recommended to all dairy-farmers, no matter whether their farms be on good or poor country. Dairy-farmers will be surprised at the results if they will adopt this simple and initial effort in the direction of increasing production, more especially when it is remembered that fencing is a permanent improvement and enhances the capital value of the property.

The pastures on Mr. Emmott's property consist of Perennial Rye, Cocksfoot, Prairie, Paspalum, and White and Red clovers. These grasses and clovers could not be improved upon, although Cocksfoot is not considered as desirable as Rye or Prairie grass. One of the remarkable features of the results of this intensified grazing system is the control that is possible over

Paspalum. During the spring and early summer of last season the pastures appeared to be all Rye-prairie-clover, but during the warm summer months and early autumn, when the Rye and Prairie grasses had disappeared the Paspalum came to light and made good feed during this period. The term "made good feed" is used advisedly, as this grass was properly controlled and not permitted, as is too often the case on rich flats, to take control of the farmer and stock as well. At all times when necessary the mower was brought into use so that the Paspalum did not grow rank and harsh.

Harrowing the Pastures.

Until the present time chain-and-tripod harrows have been used on this farm, but it is admitted that at times a more drastic working of the pastures could be given with advantage. The pastures are harrowed at least

A Heavy Growth of Perennial Rye and Clovers on Mr. A. F. Emmott's Property.

twice a year, generally in the early spring months, the idea being to distribute the dung. During the spring and summer, when full use of the pastures is being made, either in the direction of grazing or cutting for silage or hay, the luscious nature of the feed, which is always kept short for grazing, gives it a laxative effect on the cows, the result being that the manure is semi-liquid and cow-pats are not formed in the paddocks. During a dry spring or summer it would be necessary to harrow more frequently, as the drier nature of the grazing would cause it to lose this medicinal property.

Top-dressing.

Top-dressing with superphosphate every autumn has been regularly carried out for six years, but it was not until the past year that subdivision of paddocks and careful pasture management and control were embraced in the scheme.

Since 1925 there has been an improvement in the pastures, both as regards quality and carrying capacity, until at the present time they are of a particularly high standard and give of their best. The regular practice has been to top-dress with 2 cwt. superphosphate per acre in the autumn—about March or early April.

Grazing and Mowing for Silage or Hay.

To date only the milking cows have been grazed on the paddocks fully embraced in the pasture improvement scheme. This means that after grazing there is a certain amount of feed available which could well be made use of by stock other than the milkers. It is Mr. Emmott's intention during the coming season to utilise springers as followers to clean up the growth left by the cows. It is probable that there will not be sufficient followers in the form of springers; if this is so it may be necessary to utilise male stock or even to purchase sheep.

It is essential, if full use is to be made of the advantages of proper pasture management, that the growth be treated in two ways. There is definitely a correct time at which to turn the milking cows into any paddock. If due to favourable seasonal conditions the growth on a number of the paddocks is at or a little beyond the correct stage it is not possible to feed all the paddocks off to the best advantage. It is at this period that the necessity arises for cutting and storing the surplus growth either in the form of hay or silage. As to which is the better is a matter for the farmer to decide, but a practice which includes making both silage and hay is advisable. At "Home Farm" 100 tons of excellent quality pasture hay were conserved during the season 1929-30, and as this was still on hand the whole of the surplus for 1930-31 was conserved as silage. In all 200 tons were cut from 40 acres (one paddock averaging 10 tons per acre) and stored in pits.

The correct time to cut for either silage or hay is when the field is coming into flower; this may be a little earlier than favoured by most farmers, but it should be remembered that the earlier the surplus growth is off the paddock the sooner will the paddock resume its position in the grazing rotation. Also the quality of the growth at this stage is of the best, there being an absence of coarse fibrous material. During the past winter Mr. Emmott has made full use of his grass silage. From 15th June to 26th July the full ration for 120 cows consisted solely of this form of feed, two feeds daily being given. From 27th July until the present time (14th September) the 120 head have been given a full ration of equal parts of maize silage and pasture silage in two feeds per day.

It is the intention this summer to excavate silage pits on a small hummock situated in the midst of the grazing paddocks. Each pit will be of 60 tons capacity, the surface measurements being 60 feet long and 12 feet wide, with a depth in the centre of 8 feet. It is not known how many pits of this size will be required, but three as a minimum are anticipated. The cows took so readily to grass silage, and it was so easy to make that Mr. Emmott has no qualms about conserving as much as possible of the surplus in this form.

Old versus New System of Grassland Management.

To obtain the following data Mr. Emmott carefully recorded the daily factory returns and also kept an exact record of the grazing of each paddock on the farm. The figures shown are not calculations but actual returns.

Old System (60 cows).				New System (69 cows).			
—	Rainfall.	Total Milk.	Total Butter-fat.	—	Rainfall.	Total Milk.	Total Butter-fat.
1929.	points.	lb.	lb.	1930.	points.	lb.	lb.
August ...	687	20,393	695	August ...	46	37,959	1,275
September ...	102	31,692	996	September ...	48	48,221	1,575
October ...	194	47,581	1,506	October ...	504	61,534	2,353
November ...	501	53,013	1,719	November ...	84	68,857	2,441
December ...	248	58,168	1,919	December ...	345	68,312	2,501
1930.				1931.			
January ...	62	54,500	1,837	January ...	230	66,233	2,412
February ...	34	43,494	1,461	February ...	296	53,402	2,016
March ...	192	40,717	1,486	March ...	312	57,326	2,149
April	70	38,356	1,430	April ...	93	50,439	1,793
May	849	29,482	1,086	May... ...	508	47,772	1,779
June	748	26,106	925	June ...	117	39,788	1,418
July	92	27,422	917	July... ...	170	31,600	1,190
	3,779	470,924	15,977		2,753	631,443	22,902

The increased production for the 1930-31 period, as indicated by the above figures, is truly remarkable. The production for 1929-30 was about the average for a normal year. The two seasons, 1930-31 and 1929-30, are comparable as regards seasonal conditions; in fact the earlier season, if anything, was the better as regards rainfall. This is borne out by the fact that a neighbouring farmer had similar production for each season, whilst still another had a little less in 1930-31.

The cattle on this farm are all pure-bred Friesian with a butter-fat test varying from 3.5 to 4 per cent., but generally in the vicinity of 3.7 per cent.

It will be observed that under the old system sixty cows were milked, whilst under the new system the number was sixty-nine, including twenty cows on their first calves. These latter would depress the total production a little, as it is a well-known fact that a cow on its first calf will not milk as heavily as when on its third calf. Mr. Emmott intends to increase the number to eighty cows during the coming season. It will thus be seen that proper pasture management has increased the carrying capacity of some of the richest land in this district by 33 per cent. The increased production under the "new system" was 160,519 lb. milk, and 6,925 lb. butter-fat.

Following is the average production per cow for each season under each of the two systems.

Old System.		*New System.*
Milk— 7,849 lb.	... ...	9,150 lb.
Butter-fat—266 lb.	... ...	332 lb.

This shows an increase of 1,301 lb. milk and 66 lb. butter-fat per cow. Thus, not only was there an increase in the total carrying capacity, but also a substantial improvement in the average production per cow.

Another interesting observation was that, although the best day's yield of milk was 2,372 lb., the average for six months was 2,064 lb. Previous to adopting this new system of farming the best day's yield recorded was only 1,980 lb. milk, a figure that was easily beaten, even by a six-monthly average.

A New Zealand Experience.

Having the above results in mind it is interesting to compare them with those obtained by progressive New Zealand farmers. The latest record to hand is that obtained by Mr. J. Bones, of Ohaupo, whose thirty-seven cows averaged 405 lb. butter-fat in 298 days. These results were obtained on a farm of 84 acres, subdivided into thirty-four paddocks. The whole area is grassland, 28 acres of which were cut for silage and 10 acres for hay. The rotation system of grazing is adopted and top-dressing practised in both spring and autumn. In addition to the milking cows, eighty-seven head of stock were carried during the past winter.

As wonderful as was the production at Bodalla, it is considerably less than that recorded in 298 days at Ohaupo, where, it has to be remembered, the whole of the farm was grassland. Still, the returns from Bodalla are outstanding in this district. When grassland farming is able to give such returns as those cited above, it surely behoves more of the dairy-farmers in this State to give it extra thought.

Bodalla Farmers Realise the Benefits of Top-dressing.

In order to demonstrate that other farmers in the Bodalla district are following the example being set by Mr. Emmott the following data is interesting.

Bodalla Estate.—During the past autumn 150 acres were top-dressed with superphosphate at the rate of 2 cwt. per acre. As an immediate result one paddock of 15 acres, in which the cows when previously grazed have invariably dropped in production, now gives a rise of 6 to 8 gallons per day when grazed. On one farm of the estate two stacks of grass silage were made last summer. These turned out satisfactory and were fed during the winter.

Mr. H. Jeff Bate.—This farmer's property adjoins "Home Farm," and similar methods to those adopted on the latter are being carried out by Mr. Bate. In all 30 acres have been top-dressed with superphosphate at the rate of 1¾ cwt. per acre.

Mr. N. S. Bate.—Fifty-two acres were top-dressed with superphosphate at rates varying from 1 to 1½ cwt. per acre during the autumn and winter. This farmer is also subdividing his paddocks and installing a satisfactory system of watering the stock.

These few instances are quoted merely to show the progressiveness of the farmers in the Bodalla district. Many others could be mentioned who have recently adopted the excellent practices pioneered on the far South Coast by Mr. Emmott at "Home Farm."

The Effect of Drought Rations on Sheep.

TRIALS AT HAWKESBURY AGRICULTURAL COLLEGE.

[Continued from page 932, Vol. 42.]

F. WHITEHOUSE, B.V.Sc., Veterinary Surgeon, Stock Branch, and J. C. COTSELL, Assistant Sheep and Wool Instructor, Hawkesbury Agricultural College.

THE first two sections of this article presented respectively a general report of the trial and a discussion of the comparative nutritive values of the rations fed. At the termination of the feeding trials on 2nd April, 1930, the number of sheep in Groups I to VIII was respectively 3, 5, 4, 5, 2, 4, 3, 4. It was resolved to attempt to breed from these ewes, and the following is a brief account of subsequent events.

The same rations were fed, in gradually increasing quantities, and Group V (maize only) was also given small but gradually increasing quantities of oaten and lucerne hay. After three weeks of such feeding, small, but increasing quantities of lucerne hay were incorporated into the oaten hay rations and oaten hay into the lucerne hay rations. By 15th May, 1930, after six weeks of such feeding, all groups looked considerably brighter and were more active, but these changes were less noticeable in Groups I, VI, and VII. Recovery of body weight was slow. From this date the sheep were allowed access to grass for increasing periods daily, the fodder rations being maintained at first and then gradually diminished as the sheep were depastured for longer periods. By 6th June the weaning on to grass was completed.

Following the termination of the "drought feeding" five deaths occurred. One ewe from Group VIII died within two days; she had been losing condition for some time. Post-mortem examination revealed caseated bronchial lymphatic glands, which were continuous with a caseated fistula into the left lung and adjacent hepatization. Three ewes from Group III and one from Group I obtained access to the feed shed in a heavy windstorm and became gorged with maize, death ensuing before aid could be attempted. One ewe from Group II died on 7th July, 1930, and she developed a condition simulating swelled head in rams. This ewe had been sick and stupid since December, 1929, and, though she was not post-mortemed, previous cases in College sheep had been attributed to stomach worms.

The Mating.

By 6th June, 1930, the majority of the ewes were considered to be in sufficiently good condition for mating and two four-tooth Merino rams were joined on 12th June. These were run with the ewes for three months, being removed in mid-September. Twenty-five experiment ewes and three control ewes were thus mated.

Lambing.

Lambing commenced on 1st November, and was completed by 5th December. Seventeen lambs were born. No assistance was required by any of the ewes, though six were fly-struck shortly before and during lambing. One lamb died two days after birth and sixteen lambs were marked at an average age of six weeks. All the lambs appeared to be very healthy and of normal size; no further deaths occurred and no signs of ill-health were manifested.

An analysis of the lambing follows:—

LAMBING ANALYSIS.

Group.	Number of Ewes Joined.	Number of Lambs.	Lambing Percentage.
VIII	4	4	100
IV	5	4	80
II	4	3	75
I	2	Nil.	...
III	1	1	100
V	2	1	50
VI	4	1	25
VII	3	1 (died)	33
Controls	3	2	66

Breeding Index.—The whole of the lambing was completed within five weeks, and twelve of the lambs were born within the first two weeks from the commencement, *i.e.*, 1st to 14th November, which, providing the gestation periods were normal, points to conception within the first two weeks of the mating period. In the other five cases conception occurred within one month of joining.

Apparently delayed conception is not a sequel of drought feeding, though the number of ewes is not sufficient from which to draw general conclusions. Unfortunately heavy rain vitiated the attempt to note each individual service by means of raddle marking.

The Body Weights.

Body weights at varying periods are shown in the table on page 33. The weighing on 7th July followed a period of heavy rain, extending over three weeks, and all sheep on the College were discomforted by it.

Groups I, VI, and VII did not recover condition until long after the other groups, and it is thought that two ewes are incapable of complete resuscitation; the emaciated appearance which they displayed at the end of the mating period was still in evidence when lambing had commenced. The lambing percentages in these groups were low, the number of ewes mated being respectively 2, 4, and 3, and the lambs born to them respectively nil, 1 and 1, the last dying at birth, so that only one live lamb survived from the three groups. The history of these three groups during the eight months subsequent to feeding, corroborates the finding that their rations were not suitable for feeding over an extended period.

The sheep in Group III had always been in good condition throughout the experiment and the single sheep mated reared a lamb successfully.

Both the ewes in Group V were in good condition and one reared a lamb.

BODY Weights, Lambing and Wool Weights of Experiment Sheep.

Group.	Sheep No.	Body Weight.					Whether Lambed.	Wool Weight (Nov., 1929 to Jan., 1931).
		2 April, 1930.	29 April, 1930.	7 July, 1930.	27 August, 1930.	Gain or Loss.		
		lb.	lb.	lb.	lb.	lb.		lb.
I	403	52	54	63	58	+ 6	...	7
	404	61	60	Died.				
	405	49	51	55	64	+15	...	6
II	406	55	53	55	66	+11	Yes ...	7
	407	56	62	57	65	+ 9	Yes ...	9
	408	53	53	50	60	+ 7	Yes ...	8
	409	44	49	Died.				
	410	59	63	57	62	+ 3	...	8·5
III	411	71	71	60	68	- 3	Yes ...	9
	412	83	82	Died.				
	413	68	69					
	414	73	70					
IV	416	71	69	66	71	± 0	Yes ...	6
	417	51	55	52	61	+10	...	6·5
	418	64	63	59	70	+ 6	Yes ...	5·5
	419	74	77	68	79	+ 5	Yes ...	6
	420	81	86	68	71	- 10	Yes ...	9
V	421	60	70	79	66	+ 6	...	7
	425	62	69	58	63	+ 1	Yes ...	8
VI	426	51	56	56	59	+ 8	...	8
	427	51	55	49	54	+ 3	...	11
	428	52	55	57	64	+ 12	Yes ...	8
	430	48	48	44	54	+ 6	...	6
VII	431	54	54	Died.				
	432	51	58	51	51	± 0	Died.	6·5
	433	45	47	46	48	+ 3	...	7
VIII	437	57	65	63	76	+19	Yes ...	12
	438	47	Died.					
	439	78	87	81	89	+12	Yes ...	10
	440	52	56	55	60	+ 8	Yes ...	8
	441	6(	73	66	75	+15	Yes ...	10
Check	...	...	...	...	89	...	...	13
	...	...	...	...	98	...	Yes ...	15
	...	...	...	...	85	...	Yes ...	11

Groups II, IV, and VIII, which gave the best results under the drought feeding conditions, also gave the best results in recovery of condition and in lambing percentages. The numbers of ewes mated were respectively 4, 5, and 4, and the lambs born to them, respectively, 3, 4, and 4.

Observations on the Wool.

Lambing took place in November-December, 1930, thereby delaying shearing till January, 1931, when the following observations were made:—

Four fleeces—Sheep Nos. 407 and 408 (Group II), No. 420 (Group IV), and No. 439 (Group VIII), were sound throughout, *i.e.*, from shearing to shearing.

The two months taken to wean from drought rations to grass resulted in only three definite breaks (sheep No. 411 in Group III, No. 419 in Group IV, and No. 437 in Group VIII), the wools being henceforward sound. Four were sound and the remaining eighteen were in varying stages intermediate between very tender and very slightly tender without any definite break.

The exceptionally heavy and continuous rain in June-July, which also caused a decline in body weight, caused two breaks (sheep No. 427 in Group VI, and No. 433 in Group VII), the wool subsequently being sound.

The dry spell of spring was apparently responsible for definite breaks in four (sheep No. 416 in Group IV, Nos. 421 and 425 in Group V, and No. 432 in Group VII) of the eighteen which had survived the transitional period of April-May, three of them being otherwise sound wools. Further, it was the turning point in the wool growth of the remainder of the sheep which were all sound henceforward.

Conclusions.

Groups II, IV, and VIII consistently gave the best results throughout the actual drought feeding period, and during the subsequent eight months in lambing percentage, and in soundness of wool growth and recovery. Of these the last lambed 100 per cent., made the highest gains of body weight and cut the heaviest fleeces. Apparently the inclusion of even the small amount of lucerne hay provided the necessary "supplementary" balance for tissue maintenance during the twelve months' feeding, and thus facilitated quicker recovery.

This trial indicates the desirability of maintaining the health of the sheep at a high level during the drought period, of making the transitional period between drought feeding and return to grass as gradual as practicable, of allowing considerable time for recovery before joining the rams, and also, in view of the necessity of maintaining fecundity in the ewes, indicates economic waste in allowing ewes to become too low in condition.

The ewes have since been sent to Trangie Experiment Farm, where they are to be treated as ordinary flock ewes, records being kept of their health, fecundity, and progeny.

(*Concluded.*)

Infectious Diseases Reported in November.

The following outbreaks of the more important infectious diseases were reported during the month of November, 1931:—

Anthrax	11
Blackleg	3
Piroplasmosis (tick fever)	1
Pleuro-pneumonia contagiosa	4
Swine fever	Nil.
Contagious pneumonia	Nil.
Necrotic enteritis	Nil.

—Max Henry, Chief Veterinary Surgeon.

Wheat as a Pig Feed.

HAWKESBURY AGRICULTURAL COLLEGE TRIAL PROVES IT THE EQUAL OF MAIZE.

F. WHITEHOUSE, B.V.Sc., Veterinary Surgeon, and F. BOSTOCK, Piggery Instructor.

THE object of this experiment, which was commenced at Hawkesbury Agricultural College on 31st May, 1930, was to compare wheat with maize as a feed for pigs from the time of weaning until they reached the porker stage. Incidentally, the experiment also yielded valuable information as to the response of certain breeds and crosses to the two rations used, and in this respect confirmed the results of field trials carried out under less accurate control.

Four litters were used in the experiment, each being halved, one half being fed on wheat and separated milk, and the other half on maize and separated milk, green feed being supplied to both lots. The rations were identical, except that wheat was used in one and maize in the other. The method of feeding was that adopted in piggeries where labour is at a premium, *i.e.*, the wheat and maize were fed dry and untreated.

The ration containing wheat was fed to five pigs in Pen 56, which were out of a Tamworth-Poland China sow by a Berkshire boar: to the four pigs in Pen 60, ex a Tamworth sow by a Berkshire boar; to the five purebred Berkshire pigs in Pen 64; and to the five pigs in Pen 68, ex a Tamworth-Poland China sow by a Tamworth boar. The ration containing maize was fed to the five pigs in Pen 58 (same breeding as Pen 56), to the three pigs in Pen 62 (same breeding as Pen 60), to the four pigs in Pen 66 (same breeding as Pen 64), and to the five pigs in Pen 70 (same breeding as Pen 68).

As regards the rations fed, an endeavour was made to deal only with one unknown, and of the three factors—weight, total digestible nutrient, and nutritive ratio—it was decided that, from previous experience, comparable results would be more accurately obtained by keeping the total digestible nutrient constant as far as practicable. The pigs were, therefore, fed in accordance with the following table:—

Live weight.	Separated Milk.	Green Feed.	Wheat Ration.			Maize Ration.		
			Wheat.	T.D.N.* of ration.	N.R.† of ration.	Maize.	T.D.N. of ration.	N.R. of ration.
lb.	lb.	lb.	lb.	lb.		lb.	lb.	
30	4·0	0·75	1·3	...	...	1·1	...	...
50	6·6	0·75	2·3	2·5	1 to 4·3	2·1	2·4	1 to 4·9
65	6·2	0·75	2·8	...	...	2·5	...	...
80	5·8	0·75	3·3	...	...	2·9	...	...
100	5·3	1·0	3·7	3·56	1 to 5·3	3·2	3·34	1 to 6·1
120	4·9	1·0	4·1	...	...	3·7	...	...
135	4·5	1·0	4·5	...	...	4·2	...	...
150	4·0	1·0	5·0	4·48	1 to 6·0	4·6	4·42	1 to 7·4

* Total digestible nutrient. † Nutritive ratio.

As regards ingestion of the feed, Pens 56, 58, 60, 62, 66 and 70 all cleaned up their rations during the period of test, except for the first few days. Pens 64 and 68 almost throughout the test period left a small percentage of their ration daily, and the fæces in all the wheat pens always contained a fair percentage of unbroken wheat, whereas in the maize pens only a small percentage of broken grain was observed, and that at irregular intervals.

The following table shows that it took less food in every case to produce 1 lb. gain in live weight when wheat was used, and that the purebred Berkshire pigs consumed less per pound gain when wheat was an ingredient of the ration, and made the largest profit per pound gain in live weight. As regards profit per pound gain, the Berkshires were followed by the Tamworth-Poland China comebacks, the Berkshire-Tamworth crossbreds, and the pigs Berkshire x Tamworth-Poland China sow respectively.

In the case of the maize ration, the Berkshire-Tamworth crossbreds consumed less food per pound gain than any other pigs, and made the greatest profit per pound gain in live weight. They were followed respectively by the Tamworth ex Tamworth-Poland China pigs, the Berkshire ex Tamworth-Poland China pigs, and the purebred Berkshire pigs. Observations apparently indicate that the crossbred pigs are able to utilise the harder grain to better advantage than are the purebred pigs. This is in keeping with experience gained from a pig-feeding experiment in which rice and wheat rations were compared. (See *Agricultural Gazette*, July, 1930, page 535.)

THE Results Stated in Commercial Terms.

Pen No.	Pork produced.	No. of pigs.	Cost of weaners.	Feed to produce 1 lb. of gain.	Cost of 1 lb. of food.	Cost of 1 lb. of gain.	Market value per pig, less cost of weaners.	Profit per lb. gain.	Ration.	Breed.
	lb.		s. d.	lb.	pence.	pence.	£ s. d.	pence.		
56	460	5	7 6	9·531	0·267	2·544	1 10 6	1·435	Wheat	By Berkshire boar ex Tamworth-Poland China sow.
58	413	5	7 6	10·225	0·362	3·702	1 10 6	0·729	Maize	
60	413	4	7 6	8·74	0·273	2·386	1 15 11	1·787	Wheat	By Berkshire boar ex Tamworth sow.
62	276	3	7 6	9·27	0·345	3·198	1 15 11	1·485	Maize	
64	376	5	7 6	8·3	0·258	2·141	1 8 2	2·349	Wheat	By Berkshire boar ex Berkshire sow.
66	303	4	7 6	9·92	0·401	3·978	1 8 2	0·479	Maize	
68	371	5	7 6	9·647	0·252	2·431	1 7 4½	1·996	Wheat	By Tamworth boar ex Tamworth - Poland China sow.
70	357	5	7 6	9·996	0·357	3·568	1 7 4½	1·032	Maize	

The prices accepted for the various ingredients of the ration were :— Wheat, 2s. 3d. per bushel; maize, 4s. per bushel; separated milk, 2d. per gallon; and green feed, £1 per ton.

The Carcases Compared.

A representative pig was taken from each pen and weighed, then slaughtered and weighed again after dressing, and observations recorded as to the quality of the flesh, fat and bone. These particulars are tabulated below :—

Pen	Ration.	Live weight.	Dressed weight.	Loss.	Flesh.	Fat.	Bone.
		lb.	lb.	per cent.			
56	Wheat	110	89	19·09	Good	Fair	Good.
60	Wheat	107	89	16·82	Fine grain ...	Good ...	Good.
64	Wheat	122	100	18·03	Fair, inclined to coarseness.	Good	Fair.
68	Wheat	109	85	22·01	Good	Somewhat soft	Good.
58	Maize...	119	100	15·96	Somewhat coarse	Fair	Somewhat soft.
62	Maize...	116	98	15·5	Coarse grain ...	Soft.	Soft.
66	Maize...	112	90	18·96	Coarse	Soft	Soft.
70	Maize...	126	113	10·31	Fair	Oily	Good.

The carcase of the Berkshire-Tamworth pig from Pen 60 was outstanding in its excellence, and in our opinion was typical of the class desired for present-day market requirements. The flesh of the pigs fed on the wheat ration was of a much finer grain, the fat less oily, and the bone more finely textured and harder than in the pigs fed on the maize ration, though the flesh, fat and bone in the pig from Pen 70 was quite commendable.

Conclusions.

Each pig was earmarked; it was crated and weighed every seventh day on a spring balance and the results recorded. The conclusions to follow are based on daily individual observations of the pigs throughout the test.

In every case, comparing half litters of similar breeding, the "wheat" pigs gave a greater gain per pound of feed ingested than did the "maize" pigs.

The cost per pound gained was, in comparable litters, in favour of wheat.

Observations on assimilation of rations showed that maize was more completely digested than wheat.

Whole wheat, dry, is perhaps not the most economical method of feeding wheat to pigs.

Throughout the test the pigs could be differentiated by the excellent bloom of those ingesting the maize ration, and evenness of conformation of those on the wheat ration, though the difference was not marked at any time.

It is thought this experiment produces sufficient evidence to show that wheat can be properly utilised as a pig feed and that it is quite equal to maize.

Infectious Abortion of Sheep.

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., Veterinary Research Station, Glenfield.

WHILST the occurrence of infectious abortion of sheep has been reported from time to time, this disease does not appear to have the widespread incidence which characterises contagious abortion in cattle. That the condition is of economic importance is shown by the references which have appeared in veterinary literature. In the case of cattle it is generally agreed that the disease is most commonly due to infection with the bacillus abortus of Bang. In sheep no one organism is recognised as the main causal agent, but a number of organisms causing, or associated with abortion, have been described by different workers.

In Great Britain and America a vibrio has been found to cause abortion in sheep as well as cattle. In Germany abortion in sheep due to a paratyphoid bacillus has been reported by a number of investigators. In Great Britain also a paratyphoid bacillus has been shown to cause ovine abortion. *Micrococcus melitensis* (*B. melitensis*), the cause of Malta fever of goats and undulant fever of man, is reported to infect sheep in certain districts in France and cause abortion in some cases.

It is therefore of interest to bring under notice the occurrence of infectious abortion in sheep in New South Wales. In this case the cause appears to have been a diptheroid bacillus. The disease was investigated in the field by Mr. C. Blumer, B.V.Sc., District Veterinary Officer (North), and the stock inspector at Armidale. The ewes in which the abortions took place were in a flock of 4,000, and had been joined with rams on 24th April of this year. They were in good condition. The first abortions occurred on 24th July. In all about 120 aborted, and of these thirty died. The first reports stated that the owner had formed the opinion that the lambs had died in the uterus and were decomposed on expulsion. In a later case seen by the district veterinary officer and the stock inspector there was no evidence of decomposition of the foetus. This finding was borne out by the results of experimental work at Glenfield Veterinary Research Station, where there was no decomposition of the freshly expelled foetus and a lamb prematurely born was living, although very weak. The abortion was reported to be followed by a sanguineous discharge, but later the discharge became yellowish and offensive. This was probably due to decomposition of the foetal membranes which were retained.

No conclusive results were obtained from the examination of the first material submitted, except that the abortions were not due to the bacillus of bovine abortion. From a later supply of material a small bacillus was cultured, and this was found to produce abortion in small laboratory animals and premature birth of a lamb. From the aborted foetus, the lamb and the uteri of experiment animals, the bacillus was recovered in pure culture.

Further work is in progress, but it appears definite that the abortions in this flock were due to a specific infection.

Fat Lamb Trials, 1931.

COWRA EXPERIMENT FARM.

J. M. COLEMAN, Senior Sheep and Wool Instructor.

THE fat lamb trials were continued at Cowra Experiment Farm during 1931, a feature of this year's experiments being the addition of the South Down to the ram section, which previously consisted of Ryeland and Dorset Horn. The ewes, comprising Merino, comeback, and crossbred, were the same animals as used last year.

The season, generally speaking, was an excellent one, though the excessive rain and cold conditions during the early portion of the year caused the lambs to lose their bloom and sappy appearance.

Particulars of the Mating.

The following table shows the details of the mating:—

MATING Details.

Period of Mating.	Ram.			Ewe	
	Breed.	Number Used.	Percentage.	Breed.	Number Used.
3 Dec., 1930, to 3 Feb., 1931...	South Down	2	2½	Merino ...	25
				Comeback ..	28
				Crossbred ...	25
3 Dec., 1930, to 3 Feb., 1931...	Ryeland ...	4	2½	Merino ...	49
				Comeback ...	54
				Crossbred ...	54
3 Dec., 1930, to 3 Feb., 1931...	Dorset Horn ..	4	2½	Merino ...	49
				Comeback ...	54
				Crossbred ...	54

The approximate times at which the ewes of the different breeds mated with the rams of the three breeds is shown in the following table. The lambs were marked at the end of each week and the figures shown have been calculated from these data. This table includes all births, including lambs born dead and lambs that died shortly after birth, but twins are not taken into account.

TENDENCY to Mate.

Week of Marking.		Approximate time of Service.	South Down.			Ryeland.			Dorset Horn.			All Breeds.		
			Merino.	Comeback.	Crossbred.	Merino.	Comeback.	Crossbred.	Merino.	Comeback.	Crossbred.	Merino.	Comeback.	Crossbred.
May,	5–11	December ...	2	4	...	3	3	...	...	1	1	5	8	1
,,	12–18	,, ...	1	3	3	1	2	5	4	4	3	6	9	11
,,	19–28	,, ...	14	12	7	6	9	8	21	14	19	41	35	34
,,	26–1	,, ...	5	7	6	5	9	5	1	6	8	11	22	19
June,	2–8	January ...	1	1	2	4	8	6	3	6	3	8	15	11
,,	9–15	,, ...	...	...	...	8	8	13	3	6	3	11	14	16
,,	16–22	,, ...	...	...	...	1	...	2	...	...	...	1	...	2
,,	23–29	,, ...	...	...	1	2	3	2	1	3	5	3	6	8
,,	30–5	Jan.-Feb. ...	...	...	...	6	3	1	1	...	...	7	3	1

The most striking feature of this table is the number of ewes that mated with South Down rams during the first five weeks of the mating period. Out of a total of seventy-eight ewes of the three breeds mated with South Down rams, sixty-eight lambed during the first five weeks of the lambing, and only one after that period. These results are outstanding when compared with those from the Ryeland rams.

As in the previous trials the Merino and comeback ewes are on a par with regard to mating tendencies. It will be noted that the crossbred ewes mated as readily as the Merino and comeback, and in view of past experiences this is somewhat difficult to account for considering the seasonal conditions experienced during the mating period. Last year the trial did not show a marked difference between these types of ewe, but during the 1929 trial, 154 Merino and comeback ewes lambed in May, while only six crossbreds lambed during that period. The rainfall for December, 1930, was fairly heavy, viz., 210 points, but the average temperature was 69.9 degrees as compared with the average for previous years for December of 70.1 degrees, and for January, 1931, the average temperature was 72.2 degrees as compared with the average of 71.6 for this month over previous years.

The Lambing.

The details of the lambing are as follows:—

LAMBING Details.

Breed of Rams.	Type of Ewe.	No. of Ewes Mated.	Ewes Died during Lambing.	Ewes Assisted at Lambing.	Lambs Born Dead or Died at Birth.	No. of Lambs Born.	Number of Lambs Marked.	Percentage of Lambs Marked.	Percentage of Lambs Marked from each Breed of Ram.
South Down	Merino ...	25	1	1	3	25	22	88	...
	Comeback..	28	...	...	1	30	29	103·6	96·2
	Crossbred ..	25	...	...	...	37	24	96	...
Ryeland ...	Merino ...	49	1	1	2	24	35	71·4	...
	Comeback..	54	...	2	3	48	45	83·3	80·9
	Crossbred ..	54	1	2	3	50	47	87	...
Dorset Horn..	Merino ...	49	...	...	1	34	33	67·3	...
	Comeback..	54	...	4	5	41	36	66·6	72·6
	Crossbred ..	54	...	5	4	49	45	83·3	...

A remarkable feature of the lambing results is the fecundity of the South Down; the lambs marked from these crosses averaged 15 per cent. more than from either of the other breeds of ram. This is the first occasion for some years on which the South Down has contested against the Dorset Horn and Ryeland in Departmental trials, and possibly it is a little early to give this result too much prominence, although 15 per cent. appears too great a

margin to be governed only by a set of circumstances. The South Down trial was conducted with a smaller number of ewes, but the percentage per ram was the same as with the other breeds.

It will be noted that with each breed of ram (with one exception) the Merino ewe marked the lowest percentage of lambs. This has been the case throughout our experiments. In the case of the one exception in the above table, viz., the comeback ewe mated to the Dorset Horn, this group was unfortunate in that five lambs were born dead or died shortly after lambing.

Another interesting feature is that the assistance needed by both comeback and crossbred ewes lambing to Dorset Horn and Ryeland rams was greater than with Merino ewes mated to these rams; usually the Merino gives the greater trouble.

Market Results.

Owing to the shortage of sheep within the Department these lambs were not forwarded to market, as is the usual procedure. However, for the purposes of the experiment I drafted each section of lambs and valued them on 23rd September, basing my valuation on prices then ruling at Flemington.

The lambs were an excellent lot, showing the necessary "bloom" and "sappiness," and they were also of the desired weight to conform with export requirements. When valued the progeny of the Dorset Horn crossbred were on the heavy side for export, but that could not be held against this cross, as by adjustment of the time of marketing it could be prevented

The valuations were as follow:—

	s.	d
South Down—		
Merino	11	0
Comeback	11	9
Crossbred	12	6
Ryeland—		
Merino	11	9
Comeback	12	6
Crossbred	12	9
Dorset Horn—		
Merino	11	6
Comeback	12	6
Crossbred	13	3

As the figures indicate, the Dorset Horn crossbred was the outstanding cross and the lambs much better grown than those of the other crosses. Taking the progeny of each breed of ram collectively, irrespective of the ewe, the lambs from the Ryeland impressed most, and I consider that for attractiveness and appearance they occupied the first place.

The cross that did not compare favourably with the other crosses was the South Down-Merino. This should be of particular interest to breeders with lucerne and other crops available, who are contemplating added matings with the Merino ewe before and after the general mating, to ensure a continuity of supply throughout the year.

In the concluding table the return per ewe mated is shown exclusive of wool returns and based on the valuation as stated.

RETURN for Lambs per Ewe Mated.

Breed of Ram.	Type of Ewe.	Lambs to be Sold.	Average Price.	Total Return from Lambs.	Value of Ewes that Died (at 10s.).	Net Return from Ewes for Lambs.	Average Return per Ewe Mated for Lambs.	Average Return per Ewe Mated to each Breed of Ram.
			s. d.	£ s. d.	s. d.	£ s. d.	s. d.	s. d.
South Down	Merino ...	22	11 0	12 2 0	10 0	11 12 0	9 3	...
	Comeback..	29	11 9	17 0 9	...	17 0 9	12 2	11 2
	Crossbred ..	24	12 6	15 0 0	...	15 0 0	12 0	...
Ryeland	Merino ...	35	11 9	20 11 3	10 0	20 1 3	8 2	...
	Comeback..	45	12 6	28 2 6	...	28 2 6	10 5	9 11
	Crossbred ..	47	12 9	29 19 3	10 0	29 9 3	10 11	...
Dorset Horn	Merino ...	33	1 6	18 19 6	...	18 19 6	7 9	...
	Comeback..	36	12 6	22 10 0	...	22 10 0	8 4	9 1
	Crossbred ..	45	13 3	29 16 3	...	29 16 3	11 0	...

Accurate wool returns cannot be given owing to wool being transferred for educational purposes and to the lower lines of comeback and Merino wool being sold together. An approximate wool return for each type of ewe could easily be ascertained by noting the prices realised for Merino, comeback and crossbred wool respectively at the Sydney sales.

WORLD'S GRAIN EXHIBITION POSTPONED UNTIL 1933.

ADVICE has been received to the effect that the World's Grain Exhibition and Conference has been postponed from July and August, 1932, until 1933. In view of this, farmers who propose entering wheats for this Exhibition should sow again next season with that object in view.

"SEX HYGIENE AND REPRODUCTION OF CATTLE."

THE stated object of this little volume, a copy of which we received from the author and publisher, Dr. W. W. Williams, is to provide the breeder and dairyman with a rational and systematic plan for the prevention and control of breeding losses among their cattle.

After outlining the anatomy and physiology of the genital organs in the initial chapter, Dr. Williams goes on to deal with sterility, the sexual health of the non-pregnant cow, care of the pregnant cow, labor, the period after calving, care of the aborting cow, sex hygiene of the bull, care of the new-born calf, and contagious abortion. Each chapter concludes with a bibliography on the subject dealt with.

The average dairy farmer has much to gain by a study of this book, the subject being one in which he is often none too well versed.

The Growing of Cauliflowers.

JOHN DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

CAULIFLOWERS have become a crop of great importance to farmers in the more-closely settled districts of New South Wales, for there is always a keen demand for good quality cauliflowers in the Sydney markets, even in glut years. Seldom does a season pass without some cauliflowers being imported from Victoria.

This crop naturally grows best in a cool climate and for this reason it was at one time only grown extensively in tableland districts. With the introduction of improved varieties, and the great improvement that has taken place as the result of the selection of these types under New South Wales conditions, it is now possible to grow cauliflowers with success year after year in most districts. The main features of the improved varieties are earliness of maturity and the ability to produce marketable heads under rather unfavourable climatic conditions.

The districts that produce the bulk of cauliflowers for the Sydney market are situated close to Sydney on the coast or in the tableland districts. Windsor, although not altogether suited climatically to the growing of this crop under ordinary conditions, supplies vast quantities of cauliflowers to the Sydney markets. The success of the Windsor growers is due to raising varieties that are suitable for local conditions, the use of correct fertilisers, the ability to practise irrigation, and the proximity to market.

When to Sow.

Cauliflower seed is usually sown from December to the early autumn months. In the Hawkesbury districts the weather is very dry at this time of the year, and it is not uncommon for the whole of the plants to be destroyed by the hot winds; similar weather conditions at transplanting time also often interfere with the establishment of the plants, necessitating many replacements.

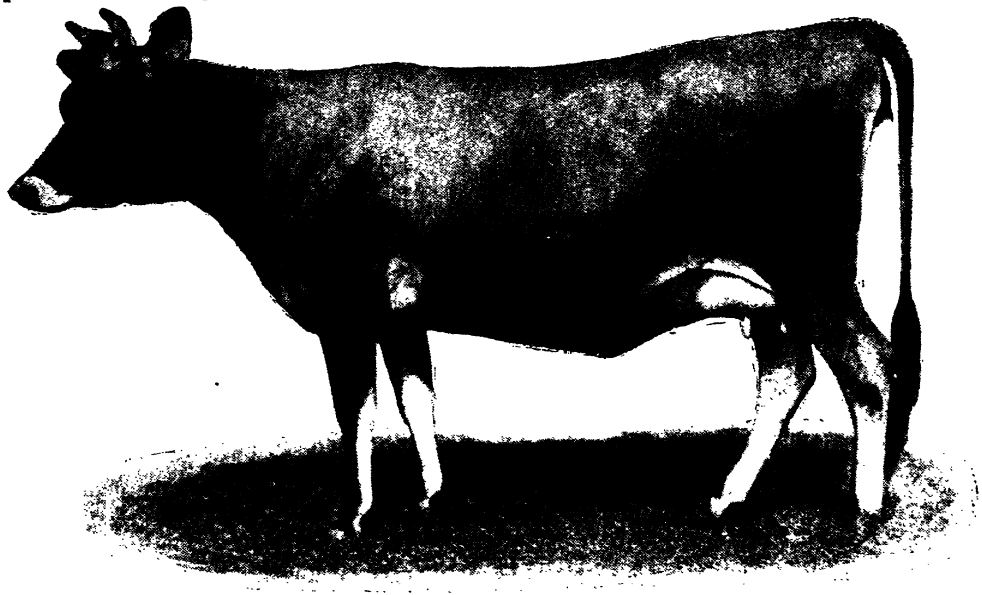
The early winter months are fairly good as a rule for the development of the curd of the plant. At this stage the plants demand cool, even conditions. Very cold weather, particularly if the season is dry, will cause the plants to grow very slowly and retard the development of the curd. Such conditions usually produce small heads. It is not uncommon in most districts for a certain amount of damage to occur through frost injury. Towards the end of the winter the climatic conditions are subject to very drastic changes.

Faults Due to Warm Conditions at Maturity.

Warm conditions are likely to cause a number of defects to develop. The common fault produced by warm weather, if the soil conditions are good, is "over-mature" or "broken" curd—caused by the rapid development of

Furriness (or Fuzziness). Riciness.

Department of Agriculture, N.S.W.—High Class Stud Dairy Cattle For Sale.



RICHMOND NERINE'S GEM (Vol. 15)

[Stationed at Hawkesbury Agricultural College]

THE following are the herd-testing records of some of the cows in Departmental herds:—Jersey Cow: Wagga Gladys (7778). This cow holds a world's record for butter production for the Jersey breed—20,835 lb. milk; 1,384·80 lb. commercial butter in 365 days. Awarded Champion Ribbon, Peter's Prize, R. A. Show, 1928. Guernsey Cow: Wollongbar Parson's Red Rose 20th (730). Holds a world's record for butter production for the Guernsey breed—17,252·5 lb. milk; 1,302·62 lb. commercial butter in 365 days. Ayrshire Cow: Miss Dot of Glen Innes (3760)—19,562·5 lb. milk; 1,088·64 lb. commercial butter in 365 days.

Heifers and bulls of proved producing lines of the following breeds are available for sale:—

MILKING SHORTHORN. JERSEY. GUERNSEY. AYRSHIRE.

For further particulars apply to—The UNDER SECRETARY, Department of Agriculture, Sydney.

the curd either before or after cutting. It is very common for this fault to develop in a load of vegetables on the way to market, as the result of the action of the heat, caused by the heaping, on the sap in the plants. "Over-mature" curd affects the keeping quality of the cauliflower, the white usually becoming soft, and readily broken. The first indication of this type of head is a loose, open appearance, while later the head spreads, opens out, and portions of the curd shoot up giving the flower a broken, uneven appearance.

Warm conditions during the development of the curd are also responsible for a defect known as "riciness," which shows as a granulated, or coral-like surface of the white of the cauliflower. Heads showing this defect are saleable, but never bring top price on the markets. Seed selection will, to a certain extent, avoid the tendency of certain plants to produce this defect.

"Furriness" or "fuzziness," a name given to a condition in which the cauliflowers show a soft, fuzzy curd, is caused by the elongation of the small individual flower stems. In coastal districts this trouble is very often associated with the greening of the curd. "Fuzziness" may be due to either (1) an unsuitable variety, (2) lack of seed selection, (3) hot dry conditions during the later stages of development, or a combination of all three factors.

Unsuitable climatic conditions may also be responsible for the discolouration of the curd, miniature flowers, and the development of leaves through the curd.

Suitable Soils.

Cauliflowers, being a leaf-producing crop are naturally heavy feeders and demand good soil conditions. The Hawkesbury alluvial flats are very rich in organic matter, and with correct cultivation are eminently suited for the production of the crop, as are also the alluvial soils on the banks of the western rivers. Although good soil conditions are very important, almost any well-drained soil will give payable results if treated correctly. On the poorer types of country it is almost essential to incorporate heavy dressings of organic matter, and to treat the soil liberally with artificial fertilisers. It is imperative to have the soil in good physical tilth and in a sweet condition. Fungous diseases develop readily in badly-prepared soils and are easily carried over from one crop to another.

Preparation of the Seed-beds.

Sufficient care is not usually exercised in seed-bed work. In the first place it is very common to find growers using the same soil year after year for seed-beds because it is situated close to the water-tap. It has been proved that this procedure is responsible for the rapid spread of many of the most serious diseases. Again insufficient attention is given to the preparation of the soil in the beds. To obtain the best results the beds should be prepared some weeks before sowing and given a liberal dressing of organic manure, which should be dug in and allowed to decay. A good practice is to give the bed a dressing of lime a few weeks before the soil is

finally finished off for seeding. If artificial fertiliser is to be used in the seed-beds it should be in the form of superphosphate alone.

The seed should be planted in rows, at least 4 inches apart, made across the beds. This practice enables the seedlings to gain sufficient room for development and also facilitates weeding. The seedlings are ready for transplanting to the field about two months after seeding.

Cauliflower Field at Windsor.

This photograph indicates the method of striking out the planting furrows. Note the seedlings in position along the sides of the furrows.

Cultivation of the Crop.

The field should be given a short fallow before planting out the cauliflower seedlings from the seed-beds. The soil should be ploughed to a depth of at least 10 inches as soon as the previous crop is removed from the field. In the case of the Windsor growers, the cauliflower crop usually follows the early potato crop, and in normal season the land is given the first deep ploughing just at the end of the year. This allows a short fallow to be worked before the first of the seedlings are to be planted in the field.

The working of the soil varies in different districts and with the type of soil and the weather conditions. Normally the soil is broken down with a heavy harrow after the deep ploughing, and reploughed at a depth of 6 inches as transplanting time approaches. The majority of coastal growers have mechanical chopping machines that are most suited to bringing the soil into perfect condition.

The field is drilled out, the furrows being spaced on the average 3 feet apart, and after the furrows have been irrigated prior to planting the artificial fertiliser is distributed along them. Departmental tests have indicated that a mixture of four parts of superphosphate and one part of sulphate of ammonia at the rate of 5 cwt. per acre is the best fertiliser to use under average conditions for the cauliflower crop. The plants are lifted from the seed beds in the early afternoon and planted in the furrows, being spaced from 2 feet to 2 feet 6 inches apart.

Cultivating-in the Furrows Following the First Irrigation after the Plants are Established.
Later irrigation furrows are opened up down the centre of the rows.

Cultivation is carried on as the crop develops to preserve the mulch and to destroy weeds. As the plants begin to approach the mature stage an attachment that will throw a small furrow against the plants, leaving a shallow ditch between the rows for irrigation purposes, is fitted to the cultivator. Just prior to the time the plants are beginning to form up the "button," the crop should be top-dressed with sulphate of ammonia at 1 cwt. per acre.

Irrigation.

No hard-and-fast rule can be followed for irrigation practice, the soil, season, and other factors influencing the amount of water and the frequency of application. So long as the soil is kept moist and not alternately saturated

and allowed to become too dry, good results can be expected from irrigation. The condition of the plant as well as the soil should be taken as guide as to whether water should be applied or not. It is usually admitted that overhead irrigation gives better results with this crop than the furrow system.

Harvesting.

For best results it is absolutely necessary to harvest the heads at regular intervals. If the crop is not inspected regularly it frequently happens that a spell of warm weather will cause many plants to develop "over-mature" curds. During the harvesting operation it frequently happens that a plant is noticed having an exposed curd that is not developed sufficiently to cut. The usual practice in such a case is to break over portion of the leaf with the object of preventing the curd from becoming damaged by frost, and also to assist in the blanching.

It is the usual practice to grade the cauliflowers. Grading is not necessarily done on size; condition of the curd is also of importance. The most desirable feature of a flower is a perfectly white curd; a curd that is damaged, soft, or stained is never placed in the first grade. Usually there are four grades, though this is dependent on the number and condition of the heads available.

The mark of the grade is cut on the stump of the stalk of the head. The top grades are not marked, second grade is indicated by one cut across the stalk, and third grade by two cuts, while the fourth grade has three cuts made across. This marking of the grades, however, varies with individual growers.

Cauliflowers are lifted from the field in farm waggons, taken to the barn or some convenient position, and loaded on to motor trucks, each grade being placed in a convenient part of the truck for unloading at the markets or railway.

Varieties.

The following varieties are commonly grown :—

Nuggets.—This variety, named after a Chinese living in the Windsor district, is a little late for a four-months' type. The plant is a very outstanding one, being very short in the main stem, inclined to be on the small side and compact in appearance. The leaves are very deep green in colour, giving the plant a very healthy appearance. The curd is very compact and solid, and is noted for its standing quality in the field. This type is more suitable for growing in second-class soil than the majority of the other varieties.

John Gardener's Four Months.—The plants are medium in size with large leaves showing characteristic white veins; the heart is only partially covered. The stem is rather short. The curd is deep and round, of excellent quality and colour, with the ability to stand without breaking up, and is naturally very firm. One of the best four months' varieties for all districts.

John Gardener's Five Months.—This is a larger type than the four months' variety. The curd is much larger and heavier with an excellent colour.

This variety will also stand well in the field, but towards the end of the season has a tendency to go furry.

John Gardener's Six Months.—This is a distinct type from the two varieties previously described. The plants are very large with the curd developed well around the stem. This development gives the flower a round appearance and is responsible for the very heavy weight of the heads. The leaves are very large, with a characteristic twist that gives the curd perfect protection. The main stem is exceptionally thick.

A. J. May Four Months.—This is a local selection and has proved to be one of the best selections on the heavy river soils over a number of years. The plants are rather short in the stem, are medium in size and inclined to be spreading. The curd is of excellent quality, medium to large in size, and usually of very good colour. The leaves are inclined to be open as the curd develops.

Four Months' Special Giant.—Unfortunately this variety takes a little longer than four months to mature, but the whole of the flowers are ready for market within a few days of one another. This is one of the most important points in cauliflower selection work. The heads are of medium size and of very clean, high quality. One very desirable feature of this variety is the ability of the heads to stand a few days in the field without over-developing and breaking up.

Early Snow White.—In the past this type has yielded very erratically in coastal trials, and it is evidently not suited to Windsor conditions. The heads are very small and not uniform.

Maitland Market.—This variety has proved the best early sort in trials in the Bathurst district, though it has never given outstanding results at Windsor, producing small heads.

Five Months' Special Giant.—The plant of this variety is very large, the leaves being much bigger than those of John Gardener's Five Months. A very outstanding feature is the protection given to the hearts by the leaves; even when the curd is ready for market the flower is well protected. The curd is very clean, dead white in colour with an excellent surface, and very well developed underneath, giving the crown a well-rounded appearance. This feature is most desirable and always improves the weight.

Late Phenomenal.—This variety is undoubtedly the most reliable late-maturing commercial type under cultivation in New South Wales. The individual plants are exceptionally sturdy and large. The stalk is very woody and large, while the leaves are large, numerous, and give a perfect covering to the curd. The curd is a very solid, pure white type of high quality; it is rounded, well developed around the stalk, is a good keeper, and has a somewhat roughened unbroken surface. Late Phenomenal is a very reliable yielder and somewhat resembles Six Months' Special Giant in general characteristics.

TUBERCLE-FREE HERDS.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date.
J. F. Chaffey, Glen Innes (Ayrshires) ...	75	4 Jan., 1932
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys) ...	59	8 " 1932
New England Girls' Grammar School, Armidale ...	29	10 " 1932
C. J. Parbery, Allawah, Bega ...	119	10 " 1932
New England Experiment Farm, Glen Innes (Ayrshires) ...	37	12 " 1932
J. Davies, Puen Buen, Scone (Jerseys) ...	85	14 " 1932
W. Spindler, Mt. Pleasant, Bega ...	66	15 " 1932
Bathurst Experiment Farm (Jerseys) ...	21	16 " 1932
W. T. Herbert, Racecourse Farm, Bega ...	68	18 " 1932
J. F. Dowe, "Woolomol," Tamworth ...	59	19 " 1932
R. C. Dickson, Elwston, Castle Hill (Jerseys) ...	17	20 " 1932
Wollongbar Experiment Farm, Lismore (Guernseys) ...	136	21 " 1932
Newington State Hospital and Home ...	108	24 " 1932
Lidcombe State Hospital and Home ...	146	11 Feb., 1932
Riverina Welfare Farm, Yanco ...	77	25 " 1932
Department of Education, Yanco Agricultural High School ...	33	26 " 1932
W. M. McLean, Five Islands Road, Unanderra ...	78	27 " 1932
Mittagong Farm Homes ...	46	3 Mar., 1932
George Rose, Aylmerton ...	4	4 " 1932
Kinross Bros., Minnamurra, Inverell (Guernseys) ...	66	5 " 1932
P. M. Burtenshaw, Killean, Inverell ...	50	5 " 1932
Miss Brennan, Arankamp, Bowral ...	10	6 " 1932
Koyong School, Moss Vale ...	4	12 " 1932
G. A. Parish, Jerseyland, Berry ...	123	13 " 1932
Lunacy Department, Parramatta Mental Hospital ...	33	16 " 1932
Cowra Experiment Farm ...	32	24 " 1932
Hawkesbury Agricultural College (Jerseys) ...	115	25 " 1932
Rydalmere Mental Hospital ...	73	25 " 1932
Russell Lamrock, Orange ...	4	26 " 1932
St. Joseph's Convent, Reynold-street, Goulburn ...	8	26 " 1932
St. John's Boys Orphanage, Goulburn ...	9	26 " 1932
Marion Hill Convent of Mercy, Goulburn ...	9	26 " 1932
Lunacy Department, Kenmore Mental Hospital ...	79	27 " 1932
St. Joseph's Girls Orphanage, Kenmore ...	9	27 " 1932
J. P. McQuillan, Bethungra Hotel, Bethungra ...	14	1 April, 1932
St. Michael's Novitiate, Goulburn ...	5	26 " 1932
James Wilkins, Jerseyville, Muswellbrook ...	89	28 " 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	205	29 " 1932
Tudor House School, Moss Vale ...	8	3 May, 1932
Australian Missionary College, Cooranbong ...	53	6 " 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	16	13 " 1932
E. C. Nicholson, Jillamatong, Corowa ...	184	2 June, 1932
Grafton Experiment Farm (Ayrshires) ...	193	4 " 1932
Hurlstone Agricultural High School, Glenfield ...	53	9 " 1932
P. Ubrihien, Corridgeree, Bega ...	133	3 July, 1932
St. John's College, Woodlawn, Lismore ...	32	11 " 1932
Gladesville Mental Hospital ...	40	14 " 1932
William Thompson Masonic School, Baulkham Hills ...	45	16 " 1932
W. Hammond, Bellingen ...	68	16 " 1932
W. R. Boughton, Holbrook ...	22	27 " 1932
Chapman Bros., Farm 166, Stoney Point, Leeton ...	31	28 " 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys) ...	42	13 Aug. 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook ...	32	14 " 1932
A. L. Logue, Thornbro, Muswellbrook ...	41	14 " 1932
E. E. Winder, Wybong Road, Muswellbrook ...	46	14 " 1932
A. Shaw, Barrington (Milking Shorthorns) ...	100	20 " 1932
A. H. Webb, Quarry-road, Ryde ...	4	24 " 1932
E. E. McMullen, Springbrook, Holbrook ...	32	25 " 1932
E. P. Perry, Nundorah, Parkville (Guernseys) ...	30	25 " 1932
Sacred Heart Convent, Bowral ...	10	26 " 1932
Department of Education, Gosford Farm Homes ...	38	2 Sept., 1932
James McCormack, Tumut ...	98	9 " 1932
Wagga Experiment Farm (Jerseys) ...	64	16 " 1932
S. L. Wills, Greendale Dairy, Cowra ...	31	16 " 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	67	16 " 1932
St. Patrick's College, Goulburn ...	7	21 " 1932
E. S. Cameron, Big Plain, Narrandera ...	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	99	29 " 1932
W. W. Martin, "Narooma," Urana Road, Wagga ...	141	13 Nov., 1932
Wolaroi College, Orange ...	11	19 " 1932
Lunacy Department, Callan Park Mental Hospital ...	31	20 " 1932
Berry Experiment Farm ...	129	26 " 1932
J. L. W. Barton, Wallerawang ...	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood ...	8	3 " 1932
Lunacy Department, Morisset Mental Hospital ...	27	7 " 1932

—MAX HENRY, Chief Veterinary Surgeon.

The Tariff Board Report.

Resumé by C. C. CRANE, B.A., Agricultural Bureau Organiser.

THE Tariff Board is doing important work. It has reviewed many industries and made available to the Federal Parliament reports containing data of great importance, obtained by independent and penetrating inquiry.

The recently published annual report of the Board merits study by those who realise the necessity of careful review of all relative facts associated with the granting of tariffs. To those engaged in production for export the report is of particular interest, not only in so far as the tariff affects the prices of their machinery and equipment, but also as it affects the general price level.

It is significant that in the case of many commodities reviewed by the Board in its report, in which duties had been granted without investigation by the Tariff Board, a subsequent Board inquiry as to whether these duties should be ratified by Parliament has resulted in recommendations in favour of a reversion to the lower rates that had been previously in operation. The reasons set out in the report for such recommendations clearly indicate the principles by which the Board is guided in its inquiries.

Swelling Profits and Sheltering Uneconomic Industries.

Some of these reasons, with illustrations of definite cases, are as follows:—

On page 10 of the report the Board states:—

> That under the rates of duty provided by the Customs Tariff, 1921–30, the industries seeking additional production were earning substantial and in some cases abnormal profits.

Substantiating this statement the case is quoted of a manufacturer in an industry supplying goods to the value of £100,000 per annum who was making 100 per cent. per annum on the capital employed in his business. Such cases emphasise the fact that tariffs have been used to build up profits and indicate the real necessity for penetrating inquiry before granting any increased duty.

Another argument against the granting of higher duties reads as follows:—

> That the increased duties asked for or proposed would represent a measure of protection out of proportion to the employment resulting from the industry.

In this respect the Board wisely draws a distinction between industries using Australian and those using imported raw materials. Obviously great caution is needed when assessing the labour involved in industries using Australian raw materials. Industries using imported raw materials are

of worth to the country only in proportion to the work done in Australia. In this connection the following reference to Kraft paper is quoted from page 11:—

> The principal raw material used in the industry is wood pulp imported from overseas. The Board found that the excess cost to users of 17,000 tons of Kraft paper estimated to be consumed annually in Australia, over the cost of importing on a duty free basis, was £12 10s. per ton (equal to £212,000 per annum).
>
> The whole of the wages paid for direct labour in the manufacture of the paper in Australia represented only £4 10s. per ton. In fact the excess cost of the local product represented more than the total expenses incurred by the Australian manufacturer in wages, coal, power, overhead and depreciation.

The report indicates that the Board's investigations furnish evidence of the establishment of uneconomic industry, and is a further proof of the necessity that inquiry should precede the handing out of duties.

Increased Employment Offset by Loss of Revenue.

That the loss of revenue which would result from the imposition of increased duties would be out of proportion to the wages that would be paid in producing the goods in Australia is another reason given by the Board for recommending lower duties.

In this connection the report gives a striking illustration of an uneconomic margin between import and excise duties, as disclosed at the inquiry recently held by the Board into the question of the refining of crude petroleum in Australia. Petrol has for the last three years been refined under what is equivalent to a protection of 3d. per gallon. A request was made to increase the margin to 4d. per gallon on "cracked" petrol. The Board estimates that 40,000,000 gallons could be refined in Australia for a wage expenditure of £30,000 per annum, but makes a liberal estimate of the value to Australia of £90,000 per year for the refining of 40,000,000 gallons. On the other hand, the loss of revenue under a margin of 3d. would represent £500,000 per annum.

One frequently hears of industry costing the community more than the total of wages involved, but here we have a case of the loss being more than fifteen times the direct wages and more than five times the estimated value of the industry to Australia. Great though the need of industry in Australia may be, it is plain that to pay in excess of its value to this extent must lead to financial difficulties.

Duties on Essential Products.

Another reason influencing the Board to recommend a reversion to the lower scale of duties was that certain goods in respect of which increased duties were sought or proposed are essential products to other industries, and anything tending to increase costs was of vital importance to those industries.

This is illustrated in the report by reference to the galvanised iron industry, which is recognised as a natural Australian industry and a consumer of considerable labour. The report, however, makes it plain that the excess cost to users at existing prices is very serious. The present

wholesale price is £28 10s. per ton. The Board calculates that on an output of 60,000 tons (half the annual demand), the price should not exceed £24 9s. 2d., but recommends a duty of £4 10s., provided the manufacturer immediately reduces the selling price to £25. This would mean a saving of £210,000 per annum on 60,000 tons. The Board further urges that the existing price is beyond the reduced purchasing power of consumers, and is checking demand by forcing the agricultural community to use either second-hand iron or subtsitutes.

Other illustrations are given in which the duty requested on essentially important articles amounts to 100 to 150 per cent.

The report concluded this section in the following words:—"The Board holds that where such duties are necessary the local production of the goods entails too great a cost to other industries in which they are used."

Protecting Burdensome and Futile Industries.

The effect of the imposition of increased duties on undertakings concerned with developmental work and essential public services is dealt with at some length in the Board's report.

One example given in this connection is in relation to incandescent electric lamps, in which case the application was for prohibitive duties. The price to be charged for lamps was 2s. 6d., but non-association lamps, of which some tested by the Board were practically as effective as the dearer lamps, were on the market for 10½d. to 1s. 9d. The Board sums up this matter as follows:—

> The Board estimated that the elimination of the cheaper lamps from the market would result in an added cost to the public of £150,000 annually, against the applicants' carefully prepared estimate of an annual expenditure of £30,000 in wages in the production locally of the whole of the Australian requirements. The Board considered that this excess cost would not be justified, and recommended against the granting of the request.

It is surely obvious that where the excess cost is so heavy, the establishment of such industry must press unduly on other industries, ultimately causing unemployment.

In some cases the requested duties would be not only burdensome, but futile. This is illustrated by reference to cornsacks. The Board found that jute piece goods, which would have to be imported frequently, would cost more than what the finished sack could be imported for. The report states:—

> This being so it is obvious that all the costs incurred locally in converting jute piece goods into sacks must represent added cost to the users of sacks.

The Board estimated that if all the bags to meet local requirements were made in Australia, the excess cost, based on average importations, would be £750,000 per annum, and it came to the conclusion that even if the duties sought were imposed they would probably not result in the establishment of the industry in Australia.

In some cases duties were imposed on industry where practically all the market was already served by local products. This is illustrated by reference to the soap industry, where the importations were less than 1 per

cent. of the Australian consumption. Other instances show that requests were made for 100 per cent. increases of duties, although the Australian manufacturers were supplying 98 per cent. of the requirements. The report concludes this section as follows:—

> Obviously there can be no justification from a protective standpoint for increasing duties under such circumstances. These relatively small importations are both a safeguard to the consumers and a challenge to the manufacturers of the goods concerned.

The Tariff Habit.

Under the heading, "The Tariff Habit," the report issues an emphatic warning:—

> The danger of tariff assistance lies in the development in industry of a sense of dependence upon governmental assistance rather than in the promotion of earnest effort to self-reliance and maximum efficiency.

Under the heading, "Danger of Excessive Duties," the following dangers are listed:—

(*a*) Undue shelter may tend to lack of efficiency or undue profit.

(*b*) Excessive duties may lead to serious over-production of manufacturing plant.

(*c*) They tend to encourage production of goods whose manufacture is so costly as to make production uneconomic.

(*d*) Prohibitive duties tend seriously to disrupt trade generally.

Under the heading, "Economic Readjustment and its Reactions on Tariff Making," the report points out the serious fall in the national dividend, and urges that the prices of manufactured products must fall in proportion if production is to be maintained. Manufacturers in many cases are striving against odds to reduce prices, but their efforts are checked by the application of excessive duties on their raw materials. Quoting from the report—

> The Tariff Board is strongly of opinion that the period of deflation through which Australia is now passing, when reductions in the earnings of both labour and capital are being forced on all, demands a systematic review of the tariff to ascertain to what extent national industry can be resuscitated by a reduction of duties on essential plant or materials. At the present time it is essential to examine the incidence of tariff as it reacts on the productive capacity of the community.

Safeguarding the Export Trade.

The risk of the imposition of increased duties jeopardising the export trade of the Commonwealth with countries supplying the goods in respect of which the increased duties were sought was taken into consideration.

After drawing attention to the risk of retaliatory action the report continues:—

> The Board does not regard the fear of retaliation sufficient justification for refusing adequate protection to Australian industries of sufficient economic value to warrant such protection. It is, however, very desirable that the export trade be safeguarded as much as possible.

Dealing with the need for expansion of export trade, the report indicates that the Board has recommended duties wherever it has considered a net increase of employment would result. The Board, however, considered it

futile to make employment in one industry if it added to the cost of the export industry already struggling for its existence. "Export industries," the report continues, "can chiefly be helped by making possible a reduction in operation costs. The risk of increasing costs to the primary industries has been constantly before the Board, for it is obvious that Australia cannot regain her prosperity till export industries are able to produce and sell at a profit."

It is essential that the more natural secondary industries shall export also. The contracted local market makes it imperative that other outlets be obtained. In order to stimulate the export of secondary products the report makes a series of suggestions.

In concluding, the report emphasises the necessity of a public inquiry before any request for amendment of customs tariff is acceded to in order to safeguard against the granting of assistance to one industry at the expense of others, or at too high a cost to the community generally. It also urges the need for a systematic review of the existing tariff to ascertain what duties, if any, are imposing undue burdens.

Why Herd Recording Should be Continuous.

For production records to be of any value, each milking cow in the yard should be tested under the same conditions, and it is therefore essential that the whole herd be put through together. It is for this same reason of making reliable comparisons between cows that herd recording once commenced should become a continuous effort—part of the routine of the farm. Each season is different from its predecessor, and herd-testing is practicable whether the season be good or bad, whether the herd is maintained on a clean, well-improved and heavily-grassed farm or on one only half cleaned-up, littered with fallen timber, full of weeds and poorly grassed, and whether the herd itself is a good one or one made up of scrubbers. This may be a good season, next year may see droughty conditions prevailing, and the herd would then be milked under totally different conditions, especially as it is the rule in Australia to rely mainly upon pastures for feeding. A cow this year may give 200 lb. butter-fat, and under the ill effects of an adverse season next year may only show a yield of 120 lb. To a great extent, every cow in the herd is similarly affected by seasonal conditions, and so the lowest yielders, if in normal condition and health, in any one year can be marked out for "culling." Another reason, and an important one, why recording should be continuous is that it may be possible to compare the records of heifer, dam, and grand-dam under similar milking conditions and so to ascertain what improvement has taken place in the yields—in other words, to test the methods of selection for breeding that have been used and the merits of the sires employed. Farmers' Bulletin No. 161, *Testing Milk and Cream and Recording Yields of Dairy Cows for Herd Improvement*, explains the whole system of herd recording and describes the technique of testing milk and cream. It is obtainable from the Department of Agriculture; price, 1s. 1d. posted.

Pectin Extract.

R. G. KEBBY, Assistant Orchardist, Hawkesbury Agricultural College.

UNTIL quite recently fruit pectin has been practically an unknown quantity to the housewife, but now that interest has been aroused (as evidenced by the increasing number of inquiries) it is deemed advisable to make information on the subject more readily available.

Pectose, which is the chief jelly-producing property of fruit and the parent member of a group of jelly-like substances called "pectin substances," is particularly abundant in green or half-ripe fruits. During the process of ripening beyond the green or half-ripe stage pectose is changed into pectin by the action of natural fruit acids. This substance, when extracted, will readily jell when mixed with sugar and boiled. Beyond the stage of "firm ripe," fruit acids still maintain their action on pectin, until eventually we find in overripe fruits a high pectic acid content, which is of no value from the point of view of jelly making. The degree of ripeness of fruit should therefore be kept in mind when selecting fruit for pectin extraction, half-ripe fruit giving the best results. This is due to the fact that most of the jelling substance (pectose) is available at this stage of maturity.

Those who are in a position to pick the fruit from the trees at the correct stage of ripeness have little need to go to the trouble of making pectin extract. Comparatively few, however, are in this happy position. The following notes, therefore, should prove helpful, particularly as the pectin extract is made from fruits or portions of fruits that would otherwise be wasted.

Apple Pectin Extract.

The ingredients required are 4 lb. apples and 4½ pints water. Wash the apples thoroughly and remove the stems and any diseased or damaged portions; the apples need not be cored or peeled.

Slice each apple into eight parts; this is better than passing it through a mincer, which tends to darken the pulp very quickly. Place the apples and water in a saucepan (not iron), so that the whole may be brought to the boil quickly. Cover the pan and boil for twenty minutes. When the boiling is finished, strain the mass through four thicknesses of cheese cloth until the juice ceases to drip. It is not advisable to squeeze the bag, but the pulp may be lightly pressed with a spoon. When dripping has ceased remove the pulp from the bag, measure it, return it to the cooking vessel, and add an equal quantity of water. Boil again for twenty minutes and strain. The first two extractions should, together, amount to about 3 quarts. Mix them together and boil rapidly until the liquid is reduced to half its original volume. This usually takes about one hour.

Citrus Pectin Extract.

Thick-skinned oranges or lemons are the most suitable. Wash and dry the fruit and then remove, by means of a stainless steel knife, the outer yellow rind, which would impart an undesirable flavour if left. Next cut off the white pith in as large pieces as possible, care being taken to leave none of the flesh of the fruit adhering to it.

Take 1 lb. of this fresh, white peel, 2 quarts water, and one teaspoonful of tartaric acid. Add the acid to water and stir till dissolved. Put the peel through the mincer (using the coarse knives), and then place it in a large enamel saucepan to permit rapid boiling. Cover the minced peel with the acid solution and let it stand for a couple of hours. Just before heating, measure the depth of the mixture in the pan, then boil rapidly and stir constantly until the volume is reduced to half the original volume. Strain through four thicknesses of cheese cloth, and allow to stand until dripping ceases. Two more extractions are made in the same manner, adding 2 quarts of water and one teaspoonful of acid for each extraction. It is not necessary to allow the pulp and acid to stand for two hours before heating, as with the first extraction. The three extractions may then be mixed together, giving about 2½ pints of extract from 1 lb. peel.

Melon Pectin Extract.

Melon pectin can be made from the rind and seeds that would otherwise be wasted when making melon jam. A further cutting up of the rind may be necessary for convenience when boiling down.

The ingredients required are 5 lb. melon rind or flesh (not including the weight of the seeds), 5 pints of water, and ½ oz. tartaric acid. Lemon juice may be substituted for tartaric acid, 10¼ fluid ounces of lemon juice being equal to ¼ oz. of tartaric acid approximately.

The same procedure is followed in this case as in the making of apple pectin extract.

Storing Pectin Extract.

Clean, sound petrol tins or canning tins are ideal containers for large quantities of extract, the liquid being poured in while boiling and the top soldered down. Any air leaks will, of course, spell disaster, and the method of testing for these is to submerge the sealed tin in a bath of boiling water for several minutes, when the heated air will be forced out through the holes (if any), causing bubbles to rise to the surface.

Pectin may be stored for periods up to three years, depending to a large extent on the quality of tins at time of sealing. Smaller quantities can be conveniently stored in preserving jars. Heat the jars before pouring in the liquid, and sterilise at boiling point for at least five minutes. In the case of citrus pectin it is advisable to sterilise for at least twenty minutes.

After some time in storage, a quantity of precipitate will be found on the bottom of the containers. If using for jelly do not disturb this, but pour the liquid off gently, or, better still, syphon it away.

Uses for Pectin Extract.

To make melon jelly, take 1 pint melon pectin, 1 pint sugar, and 2 pints water. From boiling point, the jelly test should be reached within five minutes. The same procedure is followed when making apple jelly.

These recipes are based on the assumption that the pectin was reduced to half its original volume. In cases where it has been reduced further than this it will be necessary to add more water. If, on the other hand, the reduction was not as much as 50 per cent. less water will be required. Often the colour of these jellies may be improved by the addition of more water when cooking in order to extend the cooking period.

When adding pectin to jams, this should be done when the jam is about half-cooked. Measure the desired quantity of pectin and add an equal volume of sugar—for example, 1 pint pectin and 1 pint sugar. Stir this mixture well into the jam. Very often, when using over-ripe fruit for jam, it is difficult to obtain satisfactory results, and it is in these cases that the usefulness of pectin will be most appreciated. The addition of pectin and sugar to these jams should be done when about three-parts cooked.

With regard to the disposal of the pulps remaining after making pectin extracts, it may be pointed out that in the case of apples this pulp may be stored and used as a base for jams such as melon, plum, grape, and small berry fruits. There need be no objection to the fact that it contains the cores and skins, as these are not noticeable in the jam. The pips can be easily skimmed off during the cooking process. Melon pulp can be utilised to advantage in feeding to poultry, pigs, &c. If pulps are utilised in these ways there is no waste whatever, and consequently the making and use of pectin extracts should appeal to the economical housewife.

The Growing of Lavender in New South Wales.

Replying to an inquiry as to the possibility of growing lavender in this State, Mr. E. N. Ward, Curator, Botanic Gardens, advised that lavender with ample oil content to make it payable could be grown on soil with a shallow clay subsoil on the Hawkesbury slopes or Kurrajong Heights, or wherever good citrus will grow. A good rainfall is essential.

The plants are propagated by dividing the roots and planting them in the autumn, allowing a distance of 18 inches between the plants. After the first crop every other row should be taken out, leaving the plants 18 inches apart in the rows, with 3 feet between the rows. The crop is harvested when in full flower, about February, and for the first year should yield 3 tons to the acre, producing, when distilled, 14 lb. of oil to the ton. In the second and subsequent years the yield should be about 5 tons to the acres. Fresh plantings should be made every year from the thinned-out rows, replanting the first ground after five years. To obtain the best quality oil the ground should not be too rich, nor does the crop need artificial aid in the shape of fertiliser or irrigation.

The Avocado

(*Persea gratissima*, Gaertn).

G. B. BARNETT, Fruit Inspector, Grafton.

THE avocado, erroneously called "alligator pear," is more or less a stranger in this country, and is certainly deserving of a greater popularity on account of its deliciousness as a salad material, sandwich taster, and because of its high food value.

The tree is a native of Mexico, Central America, and the northern countries of South America, and while it is common in many of the Pacific Islands it was probably introduced there. In 1883 the avocado was recorded as bearing regular crops on a tree in the Botanical Gardens, Brisbane, and

A Tree of the Fuerte Variety Growing at Wollongbar Experiment Farm.
This tree is almost ten years old and is 12 feet high, with a spread of 18 feet.

in 1914 trees were known to be growing as far south as Sydney. Trees are now established at Wollongbar and Grafton Experiment Farms, and are bearing regular crops.

Should do Well on the North Coast.

The avocado, being a native of tropical and sub-tropical regions, should do well along the North Coast, especially wherever citrus and mangoes thrive. In nature the avocado tree is found growing in a wide variety of soils, but always in a locality with good drainage, growing to perfection on

rather heavy soils with plenty of humus and moisture, and on land sheltered from severe frosts and winds. The amount of frost this tree will stand depends upon the type and variety of tree, the degree of dormancy of the tree, the severity of the frost, the length of time the cold conditions last, and the kind of weather following the cold spell. It is generally considered by avocado growers that trees of the thin-skinned Mexican type are the most hardy, and that those of the leather-skinned West Indian type are the most tender. The Mexican and Guatemalan varieties can be grown in any locality where the lemon thrives, while most of the West Indian types can be grown only in the most protected and frost-free situations.

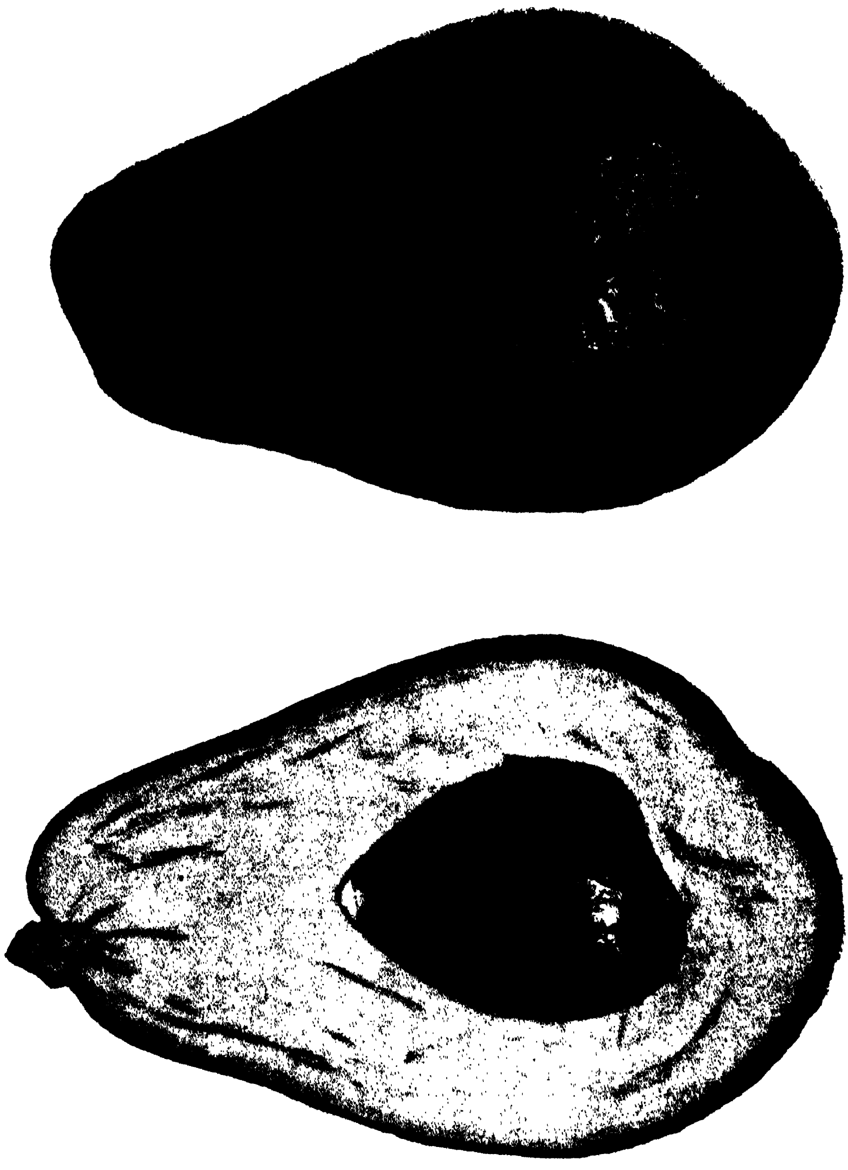
The avocado belongs to the cinnamon-camphor-sassafras family, but is the only one of this family that is cultivated for its edible fruit. The tree is evergreen, or nearly so, some varieties dropping their leaves just prior to flowering, leaving the tree bare for a short time. As regards its root system the avocado is generally described as a "surface rooter," although it may go deeper in well-aerated soils. The wood is rather soft and brittle, and of a reddish-brown to light-brown colour, while the bark is rather thick, rough, and ash-coloured. The growth of the avocado tree varies considerably from a mere bush to a very tall tree with upright or spreading habits. The foliage ranges from light to dark green. In all, the tree is noted for its beauty in shape and foliage.

Description of the Fruit.

The fruits of the avocado vary in size and shape, ranging from 1 to 6 inches in diameter, from an ounce to 3 or 4 lb. in weight, and from almost round to long and slender pear-like in shape, some possessing a curved neck similar to a small crook-neck squash. The colour ranges from light or yellowish green to dark green, purple to purplish-black, maroon, brown or reddish-brown. The writer, whilst in California, noticed that green-coloured varieties were the least popular, possibly on account of the colour suggesting unripeness.

The skin of the fruit varies in thickness, the Mexican type having a thin tender skin much like that of a pear. The fruits of the Guatamalan type have a skin which is granular or gritty, and varies in thickness from one-twentieth to almost one-quarter of an inch. The skin of the West Indian type is of a variable thickness, leathery and pliable, and not granular. In some cases the skin adheres to the flesh (mainly in the case of the Mexican type), but in most cases the two separate readily.

The edible portion of the fruit lies between the skin and the seed and varies greatly in quantity, quality, colour, and texture. It is of a soft, buttery consistency when mature, being very much like the flesh of a ripe papaw. The colour of the flesh is lemon-yellow in some fruit, in others it deepens into a butter colour with the edges near the skin shading into green. The most desirable edible types of fruit are those with a small seed and thick flesh, which in some is over an inch thick. In many seedling fruits, stringy fibres of an objectionable nature are present, but in the best



Fuerte Variety of Avocado.

[*From California College of Agric. Circ.* 43.

varieties this objection is entirely absent or almost so, and the flavour is rich and nutty. Although in the case of some of the richly-flavoured types with high oil content (some fruits contain 25 per cent. oil) a taste for the fruit has to be acquired, in the majority of cases the flavour and texture instantly appeal to the palate.

The fruit contains one seed which varies from one-quarter to over an inch in diameter, and is readily removed when the fruit is cut in halves. It is desirable that the fruit be of a type in which the seed is held firm in its cavity by the flesh, otherwise it is liable to move about and injure the flesh. Although not common, seedless fruits sometime occur.

Propagation.

As with most fruit trees, seeds are a very unreliable means of reproducing a variety. Seedlings of the avocado itself are the best stocks on which to grow a desired variety. To obtain good germination the seeds should be planted as soon as possible after removal from the fruit in beds or boxes, and removed to the nursery when of sufficient size. The seed-bed or seed-box should contain a rich sandy loam or a mixture of half sand and half leaf-mould. The seed should be planted with the pointed end up, leaving about one-eighth to one-quarter of the seed exposed above the surface of the soil.

The budding of the avocado is much more difficult than the budding of citrus trees, although it is possible that the budding of avocados has been improved since the writer heard the remark that if the history of avocado budding could be recorded the "take" would amount to about 15 per cent. only. For best results select, from the wood of the last growth of the previous year, a plump mature bud which appears just ready to burst into growth. Cut a shield bud from 1½ to 2 inches in length, having a small piece of the wood attached, and insert it in the stock where a common T-shaped cut has been made. The bud must be tied extremely tightly, avoiding covering the young bud. At the end of about three weeks re-wrap with a strip of waxed cloth or raffia.

The common practice of cutting back hard on the stock after the bud has shot in citrus trees cannot be adopted in the case of the avocado. The stock should be gradually cut back and the bud should be 6 or 8 inches high before cutting right down on the stock. While the scion is making the first 6 inches of growth the stock can be used as a stake to which the scion should be tied in order that a straight and erect trunk will result. All suckers and branches should be kept off until the tree is 2 to 3 feet high.

Grafting can be successfully carried out, but budding is much simpler. Grafting, therefore, is not recommended, except in the working-over or top-working of large and worthless seedlings to better varieties. The avocado can be successfully grown from cuttings, but this method has little to recommend it.

The tree should be balled prior to transplanting from the nursery to its permanent position, otherwise it is liable to suffer a severe set-back if removed with roots exposed. Transplanting should be done in the early

spring, thus allowing the tree to settle down and make growth before the hot summer days. Worked trees usually come into bearing in the fourth to sixth year, while seedlings take longer.

Pruning and Harvesting.

Except for pruning for shape in the early years of the tree's life, little attention is needed apart from an occasional thinning out of heavy terminal growth, deadwood, overhanging and badly-shaped branches.

It is rather difficult to describe the correct stage at which the fruit should be picked, some varieties giving timely indications of maturity, while others will remain apparently green on the tree for weeks without showing signs of ripening. No definite advice can be given on this point owing to the varying colours of different varieties when mature. The grower, however, will soon become familiar with the correct stage of maturity at which the fruit should be harvested.

The avocado is certainly of better flavour if harvested before the soft-ripe stage is reached, and stored until the flesh is reduced to a soft consistency, when it will spread like butter.

Varieties.

The Fuerte has proved an excellent fruit for North Coast conditions. Trees at Wollongbar (near Lismore) are producing regular crops of good average size fruit of excellent flavour. It is a dull-green colour, shape pyriform, average weight 8 to 10 oz., and appears to be a hybrid or cross between a thick- and thin-skinned variety.

A tree of the Lyon variety is also bearing this season at Wollongbar, the fruit being large, green, and possessing a rather large seed. At Grafton Experiment Farm several new varieties have been introduced, Blakeman and Northropp being two of the varieties, and these have given promising results in America. The former variety is of a green colour, pyriform in shape, and weighs about a pound, while the latter bears small purplish-black fruit of pyriform shape, possessing a very rich, nutty-flavoured flesh.

Pests and Diseases.

Trees growing in this State do not appear to be attacked by any serious diseases. The fruit fly is the worst pest with which the grower has to contend, especially where the thin-skinned type is grown. The thick-skinned fruit seem to withstand the fly attack much better, possibly on account of the nature of the skin. Some varieties are subject to attack by pink wax scale.

Uses.

Perhaps the most popular method of serving this fruit is to cut it longitudinally, remove the seed, apply lemon juice or salt, and eat with a spoon. It is relished by many when sliced or mashed and served on toast. Served, along with lettuce leaves, on crackers or in a sandwich, it is most inviting and appetising. What passion fruit is to a fruit salad so the avocado is to a green salad.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges. Washington Navel.	Oranges. Valencia.	Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	**25,000**
T. Adamson	2,000	2,000	700	1,000	500	**6,200**
Swane Bros.	1,000	1,000	250	500	500	**3,250**
Geo. McKee	1,000	2,000	...	...	...	**3,000**
C. Langbecker	...	750	...	...	250	**1,000**
F. Ferguson and Son ...	2,000	3,000	...	...	...	**5 000**
A. T. Eyles	3,000	2,000	...	...	...	**5,000**
R. Hughes	500	500	250	500	1,000	**2,750**

—C. G. Savage, Director of Fruit Culture.

"Fruits and Fruit Culture in the Dutch East Indies."

Fifty-seven species of tropical fruits—the most popular fruits of the Dutch East Indies—are dealt with in "Fruits and Fruit Culture in the Dutch East Indies," by J. J. Ochse. These coloured plates are especially useful to the reader with only hazy ideas about many of the fruits dealt with. We know of no better collection of coloured illustrations of tropical fruits.

Following a botanical description of each fruit are notes on the propagation, cultivation, uses, etc. It should prove a very handy reference book on many of the tropical fruits that are strangers to our shores.

Our copy from the publishers, Algemeene Boekhandel G. Kolff and Co., Batavia.

Having been assured that the quality of our best butters is such as to give complete satisfaction in competition with other butters, states the Minister for Markets, no effort should be spared by those engaged in the industry and all concerned to improve still further our methods, so that every box of butter leaving Australia will be up to the standard of our best butter, which has now established a name for Australia in the world's greatest markets.

Orchard Notes.

JANUARY.

C. G. SAVAGE and W. LE GAY BRERETON.

Cultivation.

IN many of our coastal districts the continuous wet weather has encouraged weed growth and also hindered growers in their control measures, consequently in some cases weeds have got beyond the stage when the ordinary cultivator can be used, and the land will need a light ploughing.

When an extended moist period with an absence of normal summer heat is experienced at the close of the spring, growers are apt to forget the need for conserving soil moisture for use later in the season. It is not uncommon for a long spell of unusually cool and in some places moist weather, such as has been experienced lately, to be followed by a change to the other extreme. In that case evaporation and transpiration will increase and the trees will require ample water, consequently orchardists should avail themselves of every opportunity to conserve moisture.

Summer Training of Young Trees.

This work should be commenced in the spring, as soon as it is possible to decide definitely what development the new shoots will make, but after this young or recently worked-over trees should be periodically examined during the greater part of the growing period. It is often early in the new year when young trees put on most growth, and if this is not directed some badly misshapen trees will result.

It should at all times be remembered that the foliage is the lungs and stomach of the tree, and any reduction of foliage must have a retarding influence. Topping and thinning out, therefore, should only be done where absolutely necessary. However, cases occur where training is necessary, but it should be kept in mind that it is a necessary evil, and consequently as little cutting as possible should be done.

It often happens that the leaders of young, vigorous trees grow so rapidly that their long tender growths are likely to be blown over to one side, or perhaps blown out altogether. Shortening of the leading shoots is then necessary to prevent this damage. This should only consist of pinching or cutting back the tender ends. If the topping is done to the lower part that has turned at all woody, there is danger of checking the growth altogether or for a long period, thus stunting the tree. When some of the leading shoots on a young tree are growing much stronger than their neighbours they should be checked as described above, leaving the weaker shoots unchecked.

Superfluous strong shoots should only be removed altogether if there is any danger of their sapping some of the desirable leaders which may be

required for the extension of the framework of the tree. Unless the tree is very dense these superfluous shoots should be checked by topping, but do not remove them altogether, for if the tree is thinned too much it is weakened by loss of foliage. Moreover, there is a greater liability of the remaining desirable leaders being blown out by the wind. Again, to leave superfluous strong growths in the centre of upright-growing varieties during the growing season encourages the desirable leaders to grow outwards towards the light, thus ensuring a more spreading framework.

Cases do occur, especially in young strong-growing peach trees that have been topped heavily during the winter, where trees three or four years from planting become over-dense in the head, and would consequently benefit from some thinning of the superfluous strong shoots during the growing period, in order to allow more light to penetrate to the laterals below and thus encourage a better development of fruit buds, but here again care should be taken not to overdo it.

The foregoing warning regarding excessive summer training is necessary, as the tendency is generally for an operator to become more severe as he proceeds with the work.

A leaflet, entitled "After Care of Buds and Grafts," deals with similar work to the above on trees worked over by budding or grafting. It is obtainable free from the Department of Agriculture.

Budding.

If the sap is moving freely January is a good time to bud deciduous trees. Care should be taken to secure buds for this work from healthy trees that have proved reliable croppers of a good type of fruit. The Department also publishes a small booklet on the subject of budding and grafting, the price of which is 10d., posted.

Pests and Diseases.

Citrus scales were mentioned in last months' Orchard Notes, but it is well to remind citrus growers again that this is the season of the year to deal with these pests, and to warn apple and pear growers not to relax their efforts against codling moth because their crop of fruit is light, for if they do they will probably pay dearly for their neglect next year. Leaflets dealing with the different citrus scales and with codling moth are obtainable free from the Department.

Black Spot of Citrus.

For many years orange growers in coastal districts have suffered considerable losses through black spot disease, particularly in the case of the Valencia crop. Various spraying programmes have been tested during the past season, and from the results of these it is evident that at least two applications of spray in the early part of the season are necessary in order to control the disease. Unsprayed trees in the experiment area had practically every fruit affected with spot, whereas not more than 5 per cent. of

fruits showed spots on the trees which had been sprayed with Bordeaux mixture at late blossoming in October, 1930, and which had received another application of the same spray either seven or ten weeks later.

In some years it is possible that a programme including three spray applications will give best results. Such a programme would include an application when approximately half the blossoms have fallen, an application approximately five weeks later, and a third application approximately five weeks after the second. Bordeaux (6-4-80) is recommended, and approximately half a gallon of red spraying oil should be added to each 80 gallons of spray as a spreader. Every effort should be made to keep a covering of spray on the young developing fruits.

New Fruit Fly Regulations.

Recently-amended regulations dealing with fruit fly control require every owner or occupier of land or premises throughout the State to collect at least once every three days all fallen citrus, pome, stone, loquat, and guava fruits, and at least once every three days either boil all infected and fallen fruit of these kinds or place them in a pit covered in a manner that will prevent any fruit fly escaping from the pit. It is also necessary for all Seville oranges belonging to the intermediate crop to be removed from the trees by not later than the first day of July, and for those from the main crop to be removed by the first day of September at the latest.

In addition, owners or occupiers of land or premises situated within the counties of Cumberland and Northumberland and certain immediately adjacent parts of the counties of Camden, Cook and Hunter, as specified in the proclamation, must apply a poison spray to the foliage of pome, stone, loquat and guava trees. This spraying is to be carried out at least once in every seven days for a period of five weeks immediately preceding the commencement of the harvesting or ripening of the fruit, whichever is the earlier. The quantity of spray to be applied to each tree is 8 fluid ounces, and it must be prepared in accordance with the prescribed formula. To make the spray, 1 gallon fruit syrup is prepared by boiling 5 lb. fruit in 1 gallon water. To this is added 3 gallons water, 4 lb. molasses or treacle, and 5 oz. arsenate of lead powder.

Grading and Packing Bananas.

Writing from Murwillumbah, Mr. H. W. Eastwood, Fruit Instructor, draws attention to the need for greater care on the part of many banana growers in the grading and packing of their fruit. Some growers are sacrificing a good deal of their fruit, Mr. Eastwood points out, by not giving more thought to these important aspects of their industry.

Dishonest Grading.

To brand a case with a grade mark higher than the grade of the fruit it contains is foolish, as the fruit is graded down to its proper grade by the market inspectors before it is sold by the agent or merchant.

Another practice certain to bring discredit and low returns to the grower is to place a percentage of small bananas in a case of higher grade fruit. Even if the fruit escapes the scrutiny of the inspector and is offered under the higher grade mark, it invariably sells at the price offering for the lowest grade of fruit in the case.

Case Markings.

The name and address of the grower, or his registered brand, must be stencilled on the case. The grower's initials and abbreviations of his address are not sufficient. Grade markings must be in letters and not in numerals, while such grade designations as "choice," "standard," &c., are now replaced by "nines," "eights," "sevens," and "sixes" under existing regulations. Moreover, cases containing any variety other than Cavendish must be branded accordingly.

All markings on the case must be legible and in letters not less than half an inch in height, unless they are printed on a label securely attached to the exterior of the case, when the lettering should not be less than a quarter of an inch high. Daubing with ink or scribbling on cases with blue pencil for purposes of identification is not in the best interests of growers. Stencils can be obtained from fruit agents, or can be purchased at small cost from stencil cutters.

Packing Bananas.

Bananas should be packed above the level of the case so that the top and bottom will "spring," or bulge, when nailed down. This is necessary to allow for contraction as the fruit gives up some of its moisture and for the closer settling of the fruit in position during transit. Further shrinkage also takes place in the ripening process. High packing of the fruit allows for this contraction, and the spring on the top and bottom of the case should close up as the contraction takes place, thus keeping the pack tight from top to bottom. If fruit is only just level with the top of the case when packed it will sink below the top after even a short interval, and when opened the case will appear as if it has not been properly filled. Moreover, the pack will be slack and the fruit liable to be bruised by moving about in the case during transit.

Low packing in bananas is not a frequent fault, as most growers realise the necessity for the spring or bulge, although they very often overdo it. Some growers have the idea that the bigger the bulge the better the case is packed and the more successfully will it carry. Their objective in packing is to put the biggest bulge possible on the tops and bottoms of the cases. Naturally if too much pressure is required in nailing the lids in position, not only are the top layers of fruit damaged, but other layers are also damaged, though perhaps to a lesser degree. The tighter the fruit is packed the less allowance there need be for contraction, but big bulges on cases do not always mean tight packs, as the bulge top and bottom only keeps the pack tight up and down.

To Obviate Excessive Bulge.

Excessive bulges can be obviated to a great extent by packing the centres between the rows more closely and solidly than has been the practice in the past. It is this aspect of packing bananas which needs more attention from growers generally.

Although the rows in the case may be packed firmly and keyed in position by the end fruits in the rows, this will only keep the bananas tight from end to end in the case. To prevent the rows or individual fruits moving in the direction from side to side in the case it is necessary to pack the centres just as firmly as the rows. By packing the centres solidly the rows of fruit are kept in position and flush with the sides of the case. They then cannot move inwards, *i.e.*, towards the centre of the case, there being no space to allow of this movement.

Place individual bananas in any space between the rows in the cases. This can be done in all grades excepting "nines." Grade "eights" usually meet in the centre of the case in the first and a few subsequent layers, but when the case is about half filled the layers from then on do not meet as evenly as previously, and a small space is left between the rows. This space may not be large enough to accommodate neatly single bananas of the same grade except by standing them upon their stalk ends. Even if the ends of the fruits in the next rows have to overlap the fruit placed in the centres of the case a little, it is better to do this than leave any vacant space in the centres between the rows, or to fill in the centres with bananas of a smaller grade.

The Buyer is the Judge.

It is only by filling the centre spaces between the rows firmly and well that you can keep the rows and layers in position. Buyers seldom open a case of bananas on the top or bottom, and the bulge is not closely scrutinised unless it is obviously too flat. Any extra fruit necessary to put a big bulge on a case is not taken into consideration when purchasing. Buyers usually open a case on its side, and perhaps only after they have dumped it on its side to consolidate the pack. Then if the fruit opens flush with the sides of the case it is accepted as a good pack with the centres well filled. If the pack is below the level of the side of the case it will not bring the same price as otherwise, for it is apparent that more bananas could have been accommodated in the centre of the case and between the rows in the layers.

A bulge which will keep the fruit from moving up and down in transit and allow for the fruit being just above the level of the top of the case when opened up is what is required, provided the pack is satisfactory in other respects. A case is only required to contain 1½ bushels of fruit, and to satisfy these requirements it is only necessary for it to be flush full on sides, top, and bottom when sold in the markets.

Packing the centres more firmly, filling in all the spaces between the rows, and guarding against the excessive bulge will result in a better pack being put on the market, with greater satisfaction to both grower and seller.

Poultry Notes.

JANUARY.

E. HADLINGTON, Poultry Expert.

The Outlook for the Coming Year.

WITH the opening of the New Year probably the most important question confronting those engaged in the poultry industry is: What are the prospects for the next twelve months? There are several factors which have lately changed the outlook for the current year and should fill poultry-farmers with a measure of optimism. Chief of these is the decision of the British Government to institute some protection for primary producers, including poultry-farmers, against foreign competition, also to extend preference to dominion products, while the most important local factor is the decision to continue with the Egg Marketing Board.

The confidence displayed by New South Wales poultry-farmers in organised marketing, as indicated by the recent heavy poll in favour of a continuance of the Egg Marketing Board, should give an impetus to those other States which have been endeavouring to bring about a similar form of control in egg marketing. Without some such organisation there is little hope of curtailing the influx of eggs on to our market, which makes it difficult to maintain a payable price in this State during the flush season of production.

It will depend upon the ability of the Egg Marketing Board to maintain a somewhat higher price during the next spring as to whether poultry-farmers will secure profits even equal to the past year, because the industry is faced with higher feeding costs, and a higher average price of eggs will be necessary to maintain the past year's returns. The Board will have to handle a greatly increased local production, due to so many people turning their attention to poultry-farming as one of the few avenues available to them to tide over the present economic crisis, but if a payable export price can be assured there is no reason for pessimism as regards the future of the industry. On the contrary, it appears as if there is every possibility of an improvement in London prices for our eggs, and much can be done by an extensive advertising campaign in Britain to bring about a realisation of the true value of Australian eggs compared with those arriving at the same time from foreign countries.

Experiment in Washing Eggs for Incubation.

From time to time the question has been raised as to whether the washing of eggs has any detrimental effect upon their hatchability. In order to obtain conclusive evidence on the point a test was carried out at the Government Poultry Farm, Seven Hills, during last hatching season.

Separate hatchings were tested in which were included clean and unclean eggs, both lots of which had been washed, and clean unwashed eggs as a check. The hatching percentages obtained were:—

	Per cent.
Clean eggs washed	73·5
Clean unwashed eggs (check)	72
Unclean eggs washed	66

These results confirm those of previous experiments and indicate that the washing of the eggs does not seriously affect hatching, even in the case of the dirty eggs. It would therefore appear that it is preferable to wash unclean eggs before placing them in the incubator.

Duck-raising.

Many inquiries have recently been received concerning the possibilities of duck-raising as a means of making a living, and to supply some general information on the subject the matter is dealt with in these "Notes."

Duck-farming looks attractive to the novice owing to the smaller capital outlay required than for fowls and the short period necessary to place the birds on the market, but it must be borne in mind that a large number of breeding stock has to be kept throughout the whole year where table ducks are being reared in order to raise sufficient birds for the market when prices are firm, as the eggs laid by table breeds would not cover cost of food. Moreover, there is only a limited profitable demand for table ducks, and that only for a short period of the year.

One of the factors essential to profitable duck-raising is to have a cheap source of supply of food such as restaurant refuse or slaughter-house offal to combine with other foods like bran, pollard and grains. Foods of low food value, such as excess of greenstuff, are not sufficient to give satisfactory results. The difficulty of securing cheap food supplies is the main reason why commercial duck-farming has not developed in this country to any considerable extent, and is a factor which should be considered by those who contemplate taking up duck-raising for a living, as ducks consume a great deal more food than do fowls.

This applies to both table and egg-producing breeds, and, although individual birds of the light breeds, such as Khaki Campbells and Indian Runners, have put up phenomenal records in laying competitions, there is a marked falling off in the average production when large flocks are kept together, probably due to the timid nature of the birds, which causes them to stampede at every little fright. However, when kept on a large scale they have not proved themselves as satisfactory as fowls for egg production.

Table Breeds.

For table purposes the main breeds are Muscovy, Aylesbury, Pekin, and Rouen, and the made-up varieties from these breeds, such as Buff Orpington, &c. The Muscovy is a distinct family from the other breeds mentioned, and is the most popular breed for the Sydney market. The next in popularity are the Pekin and the Pekin-Aylesbury cross, which are much sought after by Chinese. The English ducks when well-grown are ready for market at ten weeks old.

The Muscovy.

The Muscovy duck is a native of South America, and, although the breed has not gained popularity in England and America, it is preferred as best for the Sydney market. These ducks must be marketed while in the "down," *i.e.*, before they have assumed their adult plumage, which means that they should be in the prime between thirteen and sixteen weeks of age. If kept longer the flesh rapidly deteriorates and becomes strong in flavour, consequently depreciating in value.

There are several varieties of the Muscovy, viz., Black, White, Pied and Blue-dun. Good size and development and maturity are the main qualities for breeding stock. The drake is a much larger bird than the duck, and the head is more caruncled; it has a much more fierce expression than the duck. A peculiarity of the Muscovy, distinguishing it from other breeds, is that it has a swan-like hiss.

The eggs of the Muscovy take thirty-five days to hatch, and very little success is met with in hatching by artificial means. It is therefore necessary that the eggs be hatched by the mother ducks. All that is necessary by way of making nests for these ducks is to provide boxes or small casks into which is put a little sand or litter. The duck will then make a nest with feathers from her own body A secluded spot is desirable, for often when there is too much light and the birds are disturbed by the other ducks and drakes they desert their eggs. When hatched the ducklings can either be reared with the mother or by artificial means.

Mules.

When Muscovies are mated to the other families of ducks they produce "mules," but as mules do not breed it is necessary to maintain breeding stock of the two breeds when their production is desired, and although they are a superior table duck, this factor restricts extensive breeding on a commercial scale

Egg-laying Breeds.

The two main egg-laying breeds of ducks are the Indian Runner and the Khaki Campbell. Indian Runners have become recognised as great egg-producers, but, as previously pointed out, this applies chiefly where they are kept in small numbers. The flesh is good, but owing to small size they do not realise payable prices as a table duck. These ducks differ from all other varieties by their peculiar upright carriage. They are attractive from a fancier's point of view and are popular in the shows. There are three varieties, White, Fawn and White, and Fawn.

The eggs of this breed take twenty-eight days to hatch, and the ducklings are somewhat more delicate to rear than some of the other breeds.

Khaki Campbells have come into favour during recent years, and bid fair to gain greater popularity than the Indian Runners. Being somewhat larger than the Runners, they are slightly better as a table bird.

Breeding Stock.

In selecting breeding stock of any of the breeds it is essential to use only matured and good-sized birds, and close relationship should be avoided. Six ducks may be mated to each drake, but in the case of the Muscovy more may be allowed if desired.

For Muscovies it is not necessary to provide water for swimming, but it is desirable they should have sufficient water to immerse their heads and thus keep themselves clean, while the English breeds give better results when they have access to a swimming pond for at least part of the day. Without this facility good fertility will not be obtained. The ducks should not be allowed in the water until after they have laid, otherwise many eggs will be lost in the water.

Hatching.

The same general principles govern the artificial hatching of duck eggs as with hen eggs, but a slightly lower temperature and a higher degree of humidity are necessary. Temperature should be maintained at 101 deg. Fahr. during the first and second weeks, and increased to 103 deg., or even 104 deg., at the time of hatching. The eggs should be turned twice daily, particularly during the first three weeks, but in the fourth week once daily will suffice. Turning should cease as soon as the eggs begin to chip. Cooling should be done once daily after the first week, and the length of time should be gradually increased from a few minutes after the seventh day to thirty minutes towards the end of the hatch.

Moisture should be provided after the first week, either by using a tray filled with water or sand, which should be kept wet throughout the hatch. The moisture tray should be placed under the egg tray. The amount of moisture required will vary according to the ventilation allowed in the incubator. Where incubators have controlled ventilation, the ventilator should be gradually opened as the hatch progresses and be closed again while hatching is in progress.

As pointed out previously, Muscovy duck eggs will not hatch satisfactorily in incubators, and, as a matter of fact, eggs from the other breeds will not usually hatch as well as hen eggs, but with the non-sitting breeds it is necessary to use artificial means of hatching or resort to ordinary hens.

Rearing.

Ducklings do not require access to water for swimming, but should be provided with an unfailing water supply for drinking purposes. Failure to keep a constant supply of water before the ducklings frequently causes heavy mortality, because if they become short of water and then have a feed, the result is a condition often regarded as "staggers," and frequently attributed to sunstroke, but really caused by the pressure on the internal organs by the swelling of the food. It is essential that the ducklings be kept quite dry during the "downy" stage, and particular care must be exercised that they are dry before going to camp at night, otherwise sweating will occur and cause sickness.

When reared by artificial means sufficient heat should be supplied during the first three or four weeks to keep the ducklings from crowding. During this time they can be gradually weaned off heat, and can then be placed in dry comfortable quarters. The floor of the house should be of concrete, and covered with litter such as rice husks or straw. The ground upon which ducks are reared should have sufficient slope for proper drainage, and sandy soil is preferable to heavy soil. Without proper drainage the ground becomes wet and in time contaminated, and therefore a constant source of infection which may result in heavy mortality.

The months from June to September are the best in which to hatch ducklings. Late-hatched ducklings are more susceptible to diseases during the warmer months, and for this reason should, as far as possible, be reared on fresh ground.

Feeding.

A suitable ration for ducklings up to three weeks old consists of approximately one-third bran and two-thirds pollard, mixed to a crumbly consistency with skim milk, semi-solid buttermilk, or meat soup. Bonemeal, added at the rate of 1 oz. to each 1 lb. of mash, is beneficial.

After the birds are three weeks old, a proportion, according to cost, of ricemeal, wheatmeal, maizemeal, or boiled grain, such as wheat, barley, or paddy rice, can be incorporated in the mash, and meat in some form can take the place of milk. Barley is a very suitable grain for ducks. Where slaughter-house offal, restaurant refuse or rabbits are available at a low cost, these might be boiled and included in the ration to the extent of one-third by weight. Good succulent chaffed greenstuff such as lucerne, clover, or barley, &c., can also be included, provided that not more than one-fifth of the total weight of the ration is made up of this type of food and the quantity should be decreased three weeks before marketing. Too much greenstuff is not satisfactory owing to the comparatively low food value, but on the other hand foods of very high protein content such as meat-meals, &c., should be used sparingly, not exceeding 7 per cent., owing to cost and the tendency to cause digestive disorders.

Ducklings up to three weeks of age should be given just as much as they will eat in five feeds per day. From three weeks to seven weeks the number of feeds should be reduced to four, and thereafter until marketed, three feeds are sufficient.

Birds intended for breeding stock may be fed on the rations described above till seven or eight weeks old, when the evening feed may consist of partly dry grain and partly mash, and later the dry grain only will suffice for the last meal.

A good arrangement to prevent young ducks after they are a few weeks old tramping on the food is to have a trough fitted on the outside of the run with perpendicular wires or staves for the ducklings to feed through. Plenty of feeding space is, of course, necessary to prevent the birds trampling one another.

A regular and frequently changed supply of shell grit, ashes, and sand should be given to the ducks through all stages.

Housing.

For rearing young ducklings after they have passed the brooding stage it is essential to have cosy yet well-ventilated sheds, and it is preferable to house the birds in lots of about fifty to seventy-five, for which number a building 12 feet long, 10 feet wide, 7 feet high at the front and 6 feet high at the back, is required. The front may be left partly open and the roof should overhang at least 18 inches to prevent rain beating in and causing the floor to become wet.

After the birds are about eight weeks old all that is necessary is a dry shelter shed giving protection from cold winds. It is essential that the floors of the houses for all stages be concreted to facilitate keeping them clean and in a hygienic condition.

Diseases of Ducks.

Generally speaking, ducks are fairly hardy and are subject to few diseases, and when disease does break out it is usually the result of bad conditions and faulty management, or of inherent weakness due to breeding from unsuitable or closely-related stock.

White eye, enteritis and staggers, are the three most common complaints met with in ducks.

White Eye.—This disease is undoubtedly analogous to roup or catarrh in fowls, and chiefly results from over-crowding, sweating, or contamination of the ground. Sweating often occurs through the ducklings getting damp or wet and going to camp in that condition, and for this reason it is essential, as previously pointed out, that the birds be kept dry while they are in the "down," *i.e.,* before they become feathered. "White eye" is highly contagious and may cause heavy mortality. The main symptoms are a frothing at the eyes, which causes the down around the eyes to become dirty and sticky. There may also be a discharge from the nostrils. The birds lose their appetite and gradually become light.

Treatment.—Very little can be done towards effecting a cure when birds have contracted this disease. The first consideration, however, is to remove any predisposing conditions such as outlined above. Any affected birds should be isolated, and care should be taken to ensure that contact is not made with healthy birds.

In the early stages of the disease affected birds may be treated by swabbing the eyes and syringing out the nostrils with a wash of peroxide of hydrogen, using half peroxide and half warm water, or a boracic acid and salt solution made by adding a teaspoonful of boracic acid powder and half a teaspoonful of salt to a breakfast cup of warm water. A strong solution of permanganate of potash may also be used in the same way. Birds which do not respond to treatment in a short time should be destroyed and burnt, and the ground upon which they have been run should be thoroughly cleaned up, well limed, and the cleanings disposed of so that other birds cannot come in contact with them. The land should not be used for rearing ducks for at least a year or two.

Enteritis.—This complaint usually follows the use of sour or mouldy foods, excess of concentrated food, or insanitary conditions such as the presence of pools of stagnant water, dirty water vessels, &c. In such cases the only course is to locate and remove the cause of the trouble.

Staggers.—A common cause of the condition known as staggers is a temporary shortage of drinking water and the birds feeding before the water supply is replenished, or at the same time. In these cases death usually occurs in a short time. Other contributing factors are "cramp" resulting from damp quarters, undue exposure to the sun, nutritional deficiency, or weakness caused through breeding from degenerate stock.

"Battery Brooding."

WHATEVER might be said for or against battery brooding, there is no denying the fact that it is a subject of great interest among poultry farmers at present. The publication of "Battery Brooders," by Milton H. Arndt, is therefore timely. This work claims to be a complete exposition of the important facts concerning the operation and handling of the various types of battery brooders. It contains over 300 pages, including many illustrations, and is retailed in U.S.A. at 2 dollars.

Our copy from the Orange Judd Publishing Co., New York.

A Word of Advice to Prospective Orchardists.

FRUIT-GROWING is an industry which demands, no less than any other business, special knowledge and training if the enterprise is to be attended by success. In many cases, unfortunately, a realisation of this fact has only been acquired after many laborious months and the loss of such capital as the would-be fruitgrower possessed. Anyone proposing to take up fruit-growing as a means of livelihood is advised first to take stock of his resources, his knowledge and his aptitudes, and to embark upon the venture only after he has satisfied himself that he is thoroughly equipped in every way, for hard and protracted labour without reward is all that awaits those who are not thoroughly fitted for the business. Such fitness includes many qualifications—strength of body and mind, judgment, determination, knowledge, and skill. For the prospective grower must be a labourer, mechanic, naturalist and business man. Anyone without previous experience would be well advised first to spend at least twelve months with a good practical orchardist. The experience he will gain will be invaluable. He will learn the actual requirements of the situation, and acquire not only knowledge and ability, but confidence also. He will, too, be thoroughly tested. If he has looked upon the life of an orchardist through rose-tinted glasses and has regarded it as a sort of idyllic existence in which with little labour or skill a man can make an easy living, his mind will be enlightened and he will find that he must choose between giving up such dreams and entering some other occupation, or facing the position boldly, rising early and working hard. Even then his rewards will fluctuate and will often be affected by circumstances wholly or partly beyond his control.—H. BROADFOOT, Special Fruit Instructor.

CONTENTS.

Championship Field Wheat Competitions.

THE JUDGES' REPORTS.

Riverina Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

THE number of entries in the Riverina wheat area was larger than in any previous year, and the crops submitted were generally of an excellent standard, the estimated yields of three crops being 40 bushels per acre or over, while the average for all crops was 37⅓ bushels per acre, which is a record in these contests.

The districts which were represented in the competition were Ardlethan, Ariah Park, Barellan, Berrigan, Bidgeemia (Agricultural Bureau), Deniliquin (Farmers and Settlers' Association), Lockhart, Narandera, Walliston (Farmers and Settlers' Association), and West Wyalong. This is the first year that Bidgeemia and Walliston have competed in these inter-district contests.

Judging was commenced at West Wyalong on 23rd November and completed at Lockhart on 27th November.

The Season.

The following table shows the total rainfall during the fallow period and the monthly registrations during the growing period in the various districts. The average rainfall for the growing period is also given for comparison:—

RAINFALL Registrations at the Different Centres.

District.	Fallow Period (June, 1930, to March, 1931).	Growing Period.								Average Rainfall for the Growing Period.
		April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.	
West Wyalong ...	1,915	309	641	546	129	68	129	40	1,864	1,008
Ariah Park ...	1,750	257	759	553	98	53	147	51	1,918	1,153
Ardlethan ...	2,252	180	566	551	99	87	136	56	1,675	1,151
Barellan ...	1,817	152	625	435	71	45	121	45	1,494	1,042
Griffith	2,059	162	382	533	89	53	125	81	1,425	1,051
Narandera ...	2,010	142	517	555	98	76	127	93	1,608	1,098
Deniliquin ...	1,605	248	334	409	108	72	171	132	1,474	1,057
Berrigan ...	2,012	254	411	454	104	91	106	142	1,562	1,161
Lockhart ...	1,946	237	488	735	134	100	214	94	2,002	1,193

*Mr. Stening, judged this championship competition.

Succeeding four years of abnormally low rainfall, there was a superabundance of rain this year. However, the season was most favourable for wheat crops which were sown sufficiently early, provided they were not situated on low-lying land subject to waterlogging. The total rainfall during the fallow period greatly exceeded the average, and heavy registrations during March ensured ideal seeding conditions.

Unfortunately, a continuance of heavy rains during April and May seriously hampered seeding operations, which were brought to a termination about the middle of May as the result of the saturated condition of the soil. Owing to further rains during June it was not possible to proceed with sowing until August, when the season was too far advanced for sowing with a reasonable chance of the production of payable returns. In some districts the rainfall during the four months March to June was over 19 inches, thus exceeding the average for this period by more than 13 inches, but even so the crops did not suffer to the same extent from excess rainfall as in the districts situated further east.

The rainfall registrations during the spring months were considerably below average, but the crops did not suffer, since, aided by mild temperatures and an absence of winds, they were able to subsist on the subsoil moisture and produce a good sample of plump grain. A storm about the middle of November caused some of the tall, heavy crops to lodge, especially varieties possessing weak straw.

The Leading Crops.

The prize-winners were:

1. Elwin Bros., "Lochleigh," Colinroobie (Barellan Society).
2. E. Henry, "Glenhope," Beckom (Ardlethan Society).
3. L. E. McKenzie, "Sherwood," Ariah Park (Ariah Park Society).

Details of awards and of the cultural methods of each competitor's crop are shown in the accompanying table.

This is the second occasion in the three years since the districts in the wheat belt were regrouped for the purpose of these competitions, that the championship has been awarded to a crop in the Barellan district. It is a distinction that is well merited, as the farmers in this district leave no stone unturned whereby they can increase the efficiency of their farming practice; particularly is this instanced in the keen interest that is always shown in the annual crop competitions; the entries are always very large, and this year reached the record number of fifty-three.

The championship was won by a very uniform crop of Penny which combined good ear development with density and excellent grain sample, and was estimated to yield 41 bushels per acre. It reached a high standard as regards freedom from disease and weeds, and except for the presence of some strangers it was difficult to fault. The soil on which the crop was produced was a light red loam, and had originally been timbered with pine and box.

The crop which was awarded second prize was also estimated to yield 41 bushels per acre. It was a tall, heavy crop of Ford, a large proportion of the ears of which had filled three grains wide, but it barely reached pure seed standard and flag smut, as well as a little foot-rot and loose smut, were present. The crop was grown on a red loam which had been under cultivation for over thirty years, but it was remarkably free from weeds.

The third prize crop was also of Penny, but in this case was grown on a heavy, black clay soil, which in the virgin state had carried heavy box timber. It was a very dense crop with a few lighter patches due to waterlogging in depressions, and should average 40 bushels per acre. Disease was practically non-existent, but there was room for improvement as regards purity. The weed growth consisted chiefly of canary grass with an odd wild oat and thistle, but considering that at least thirty crops had previously been grown on the land, the weeds had been kept well under control.

Lessons from the Season.

Fallowing.—Sound cultural methods were practised by all competitors. While in most cases the number of cultivations given to the fallow was limited to two or three, in every instance the fallow had been ploughed early and the cultivation in the spring had not been neglected. With the price of wheat at the present low level, there is a need to keep down production costs, and close attention is required to those details which will improve yields without unduly increasing working costs. It has repeatedly been proved that better yields result when the initial ploughing of the fallow is performed in June or July than if it is left till October, and it is no more costly to plough early than late—generally, the contrary, since the land is invariably in a better condition for ploughing in the winter months.

It is not so much the number of times that a fallow is cultivated that counts, but that the cultivations should be carried out at the correct period. The cultivation of the fallow with the springtooth cultivator in the early spring should on no account be omitted, as it is cnsidered of the greatest importance not only as regards the conservation of moisture, but also in the preparation of an ideal seed-bed. Provided the soil is in satisfactory condition, it would no doubt be preferable were this cultivation carried out in these districts in August rather than September, as practised by the competitors, or better still, that the fallow be broken down with the harrows during August, to be followed with the cultivator in September.

Unless for the purpose of destroying weeds, there is nothing to be gained by cultivating fallows during the summer months, but a shallow cultivation with the scarifier about March will prepare an excellent seed-bed.

Varieties.—Since it won the championship and also the third prize, Penny must be regarded as the most successful variety in this competition. This result, taken in conjunction with its successes in previous competitions, indicates its suitability for the climatic conditions experienced in this part of the wheat belt. It has proved that it can adapt itself to various

types of soil; for instance yields of 40 bushels per acre have been produced on a light red loam as well as on a heavy black clay soil. Penny is proving a strong rival to the old favourite Yandilla King. Two crops of the latter variety competed in the competition, but although the prospective yields were high, other factors operated to deprive it of a chance of claiming the honours which it achieved in the two previous years.

Nabawa was not as prominent as is customary, chiefly for the reason that heavy crops of this variety were damaged by the storm which occurred about the middle of November. Furthermore, the season was more favourable for late-maturing varieties, and on this account the gaining of fourth and fifth places in the awards is very creditable.

This is the first occasion on which Ford has appeared in the competition in this division. As the result of the success of this variety in the championship competition in the northern division last year and its successful resistance to rust, farmers in other parts of the wheat belt are testing it out, and judging by the excellent performance in winning second prize and its general promise on experiment plots, there is a probability that it will also forge ahead into the front rank of successful varieties in these districts.

It is some years since Federation won a local competition in this division, and the crop which competed for the championship this year was not very successful in comparison with other varieties. The chief defect of this old favourite, and the reason of its decline in popularity, is that it is extremely susceptible to all the diseases to which wheat is liable, and the crop judged in the competition lost several points owing to the presence of flag smut.

Free Gallipoli is the most popular variety in Victoria, where it is superseding Federation, and it also has a certain vogue in the southern districts of New South Wales, but it also is very susceptible to flag smut.

As it was not possible to proceed with sowing during the greater portion of the normal seeding period for early-maturing varieties, the representation of these varieties was not so large as might be expected normally in these areas. The only early-maturing varieties that succeeded in winning a local competition were Waratah and Bobin, the latter forming a portion only of one crop. Waratah is still the leading early-maturing variety, but Bobin is promising to be a strong rival in these districts, as it has the capacity for the production of high yields, holds its grain better, and is less subject to flag smut than Waratah. Its chief defect is susceptibility to stem rust, and it has also been noted that frequently the grain is not plump.

Seeding Operations.—There was a variation in the time of sowing from the first week in April to mid-May, after which seeding operations were prevented owing to the boggy condition of the soil, but in normal seasons the seeding period can be safely extended to the end of May by the use of early-maturing varieties. Sowing as late as August, as was practised by some this year, is much too late, as the chances of payable returns from such late sowings are extremely meagre.

Details of Awards—Riverina Wheat Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops Grown Previously.	Points Awarded. Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum, 20 points).	Freedom from Disease. (Maximum, 30 points)	Evenness. (Maximum, 20 points).	Condition. (Maximum, 10 points).	*Cleanliness. (Maximum, 30 points).	Total Points.
					lb.	lb.								
Elwin Bros., "Lochleigh," Colinroobie.	Barellan ...	Penny	Ploughed 3½ inches July; springtoothed September; scarified February; scarified March.	2nd week April.	60	45	6	41	17	29	19	9	29½	144½
E. Henry, "Glen Hope," Beckom.	Ardlethan....	Ford	Ploughed 4 to 5 inches July; springtoothed October; harrowed February; springtoothed March.	3rd week April.	60	60	Very old land.	41	17½	27	19	9	29½	143
L. E. McKenzie, "Sherwood," Ariah Park.	Ariah Park	Penny	Ploughed 3½ inches June-July; springtoothed September; disced and harrowed March.	3rd week April.	75	45	Very old land.	40	17	29½	18	9	28	141½
W. E. Mitchell, "Mountain View," Yenda.	Griffith ...	Nabawa ...	Ploughed 3½ inches in August; scarified October; harrowed December; scarified January.	Last week April.	50	40	5	37	18	28	19	9	28 (29)	139
S. R. Jarvis and Son, "Taunton," Lockhart.	Lockhart ...	Nabawa ...	Ploughed 3½ inches in June; springtoothed September; springtoothed March.	1st week May.	70	60	5	39	18	28½	17	8	27½ (29)	138
Mrs. A. S. Doncon, "Quandong," Warbreccan.	Deniliquin (F. & S. Assn.).	Waratah ...	Ploughed 3½ inches in July; harrowed after ploughing, and again in October.	Mid-May	75	48	6	35	19	26	19½	9	29	137½
G. R. Rentoule and R. Bond, "Balmoral," Berrigan.	Berrigan ...	Free Gallipoli ...	Ploughed 3½ inches in May; harrowed June; cross-harrowed July; springtoothed October and March.	Last week April.	60	47	Old land.	37	18	27	18½	9	27	136½
J. Wells, "Rosedale," Girral.	West Wyalong.	Bobin (35 acres), Nabawa (15 acres).	Ploughed 4 inches in June-July; springtoothed September; harrowed October; springtoothed and scarified January; scarified and springtoothed March; scarified before sowing.	1st week May.	66	56	4	33	19	28	19	9	27 (28)	135
P. L. Lord, "Dooling Dooling," Urana.	Bidgeemia (Agricultural Bureau).	Yandilla King ...	Ploughed 5 inches in June; scarified September; scarified March.	3rd week April.	60	84	6	38	18	24	17½	9	28½	135
T. C. Davies and Son, "Parkside," Brobenah.	Narandera	Yandilla King...	Ploughed 3½ inches in June; springtoothed October; springtoothed March; harrowed April.	1st week April.	60	45	First crop since land spelled for five years.	39	18	27	19	9½	22 (24)	134½
G. Jasper, "Lone Pine," Walliston.	Walliston ... (F. and S. Assn.).	Federation ...	Ploughed 3 inches in July-August; harrowed August; springtoothed September; harrowed March.	End April	45	45	3	31	19½	25	17	9½	26½ (27)	128½

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses is shown the maximum when under 30.

The rates of seeding ranged from 45 to 75 lb. per acre, with an average of 62 lb. per acre, which is almost identical with the rates adopted in sowing the competition crops in this division in the two previous years. The quantity of superphosphate applied to the crops varied from 40 lb. to 84 lb. with an average of 52¼ lb. per acre. This is a material reduction in the quantity used in the two previous years' competitions, viz., an average of 71¾ lb. in 1930, and 79½ lb. in 1929.

The general reductions of the quantity of superphosphate applied was due chiefly to the urgent need for economy on account of low wheat prices and financial stringency, but the early sowing of the crops was also a factor, as early-sown crops require less superphosphate than is necessary for late-sown crops. The competitors in this division have followed a safer course in reducing the quantity of superphosphate per acre than many competitors in the western wheat area who sowed their crops without fertiliser.

Diseases.—In every crop inspected there was some evidence of foot-rot, which was the most prevalent fungous disease this season. It is a difficult disease to control as it is soil-borne, being carried over from year to year by means of diseased stubble. Measures that are recommended for the control of flag smut are of value in reducing infection of foot-rot, namely, the burning of stubble, and rotation with a non-susceptible crop such as oats.

With the exception of a crop of Waratah and one of Yandilla King, which were badly infected, not nearly so much loss was occasioned by flag smut as in recent years, probably as the result of the compaction of seed-beds by the early rains.

Stem rust was present in one crop which, however, was too advanced in maturity to suffer any appreciable damage.

Northern Wheat Area.

G. C. SPARKS, H.D.A., Manager, New England Experiment Farm, Glen Innes.*

THE northern field wheat championship of 1931 comprised the largest field since the inception of the competitions. With the exception of Binnaway all districts competing in 1930 were again in evidence, and numbers were increased by entries from Tambar Springs, Tareela Springs, and Curra-bubula, the latter on this occasion having its own local competition distinct from Tamworth or Quirindi.

The prize-winners were as follow:—

1. J. Cavanagh, "Springhurst," Curlewis (Gunnedah Society),
2. N. S. Richards, "The Brigalows," Duri (Tamworth Society).
3. A. H. Nixon, "Oakhampton," Upper Manilla (Manilla Society).

Mr. Cavanagh's successes in the northern championship extend over a number of seasons. His winning crop of Nabawa this year was on a heavy chocolate to black loam now cropped for the fifth time and under wheat in

* Mr. Sparks judged this championship competition.

1930. In preparation for the 1931 crop the stubble was burnt and the land scarified in January and again in March. Seeding was done in late April with 45 lb. of seed, unmanured. The crop was heavily fed off in June. The estimated yield was 40 bushels per acre, purity and trueness to type were very high, but points were dropped due to the presence of traces of flag and loose smut and some patches of stem rust, the latter probably being due to small "soaks." Two points were deducted on the score of cleanliness owing to the presence of wild oats and thistles. The impressive fact about this crop, apart from its general excellence, was the trivial amount of tillage required to produce it, and it is very obvious that consummate judgment must have directed operations.

Mr. Richards' crop of Ford was on red, self-mulching loam, old land under wheat in 1930. Stubble was burnt and land "suntyned" and harrowed in January, springtoothed late February, and again twice before sowing in early May with 56 lb. of seed—ungraded, untreated, unmanured. The seed from which this crop was grown came from the champion northern crop of 1930 which possibly justified the obvious risks taken with it. Mr. Richards' crop was estimated to yield 38 bushels, was true to type, but carried some "strangers." Disease was represented by a trace of flag smut, some foot-rot, and the usual issue of stem rust; it was very dense and fairly even and exceptionally weed free, a very few wild oats and a little mustard being the only blemishes in this regard. Some frosting was evident. The crop was heavily grazed—1,500 sheep on 180 acres for four weeks in July.

Mr. Nixon's crop of Yandilla King was on red loam, under cultivation for thirty-six years. The stubble was fed off by large stock in summer 1930-31, and the land mouldboard ploughed 4 to 4½ inches deep in February, springtoothed mid-March, and sown between 28th March and 12th April, and given a medium-weight harrowing; seed, 60 lb., graded, but untreated otherwise; no manure. The apparent yield was 35 bushels, but the crop was slightly impure. It was, however, disease-free except for a trace of stem rust, was relatively even, and, considering the "age" of the land, was extraordinarily weed free—a trace of wild oats being the only detriment.

Full details of tillage and points awarded to all competing crops are shown in the table on pages 86 and 87.

The Season.

The season 1931 was marked by copious rainfall. Records are, however, more than usually incomplete, as in wet years less interest is displayed in recording individual falls, and on this occasion figures are available from four centres only. During the April-October period the recorded falls ranged from 10½ inches at Curlewis (Gunnedah) to almost 15 inches at Bugaldi (Coonabarabran), where the June fall was 598 points, while Manilla recorded 498 points in May. Naturally so heavy a precipitation had a harmful effect upon tillage, and generally it was quite impossible to carry out planting programmes. In many cases it was preferred to

reduce areas rather than take the risks atendant upon late seeding in rough seed-beds. Early sowings, however, made rapid growth under the mild winter temperatures, and the advent of drier and warm spring weather was very helpful in bringing the crop safely to maturity.

Cultural Methods.

The crops were all relatively early sown, none being later than mid-May. Until quite recently mid-winter sowing was much in evidence, but over the last couple of seasons there has been a very marked tendency to make early seeding and to feed off heavily during the winter months. This is obviously a sound practice under the usual conditions prevailing in the north, and enables maximum use to be made of the commonly copious autumn rains. The seeding rate ranged from 39 lb. per acre at Boggabri to 60 lb. at Manilla, and averaged 46½ lb. per acre. In almost every case the seed was graded, but a notable exception was the Tamworth crop, which apparently did not suffer unduly by the omission; it has been noted above, however, that this parcel of seed came from the champion crop of the previous year and it is to be hoped that there will be no tendency amongst farmers to ignore the importance of the grader. No crop received any manure, and the position as regards superphosphate in the northern areas is unaltered, viz., at the moment there is no apparent justification for its use. Practically all entries were sown with the combine.

The whole of the entries were on short (summer) fallow, and to anyone accustomed to southern standards it seems extraordinary that such excellent yields should be attained by so little tillage. Only 40 per cent. of the entries were ploughed, the remainder being tilled by cultivator only. At Boggabri a 34-bushel crop was produced by one springtoothing fifty-two days prior to seeding; one must be impressed by the ease with which good seed-beds can be produced in northern soils. Even in unfavourable years a relatively light amount of tillage is all that is necessary, and this has a very helpful effect upon costs of production in the north, and coupled with the saving on manure and the possibility of producing wheat abundantly each season on the same land for indefinite periods, gives to the north the greatest future of any part of the Australian wheat country. There is a popular impression to the effect that there is more "kick" in short than in long fallow in the north—that other things being equal higher yields can be anticipated from the former than from the latter, but it has long been a recommendation that all areas should be long fallowed once in three years for weed and disease control. It has been shown what northern farmers and soils can do in seasons of copious rainfall, but it is up to those men to design their 1932 programme with the idea of meeting dry weather—to fallow at the earliest possible moment, to give the fallow all the working it needs, and to think seriously of long fallowing certain areas.

Varieties.

The outstanding feature of the 1931 championship is the jump into popularity of the wheats Ford and Nabawa, which made up 75 per cent. of the entries. These wheats, although now very well known, are comparatively new to northern farming, but their complete suitability for growth under the soil and climatic conditions of that territory makes them very safe favourites. At times doubts are expressed of the capacity of these wheats to withstand drought, as their success has come in good seasons; these fears, however, should be without justification, as the records of these wheats in other parts of the Commonwealth and the fact that they have been exhaustively tested upon farmers' experiment plots are sufficient recommendation. Yandilla King, Cleveland, Duri, and Waratah each made one appearance only.

Disease.

Stem rust in varying amounts was present in all crops. This is, of course, a seasonal disease, and the penalty for its presence was very light. Northern farmers seem to be adopting the only possible means for defending themselves against rust epidemics by growing only those wheats which carry the recommendation of the Department of Agriculture and by making seasonable seedings.

There was an extraordinary reduction in the amount of flag smut this year as against the infection of, say, 1929. This is, no doubt, largely due to weather conditions and the use of resistant wheats, but tillage which produces a moist, compacted seed-bed, and promotes quick germination is a potent factor in control also.

Loose smut was present in about half the crops inspected, but the infection was always very light, only odd heads showing up.

About 60 per cent. of the championship crops had foot-rot. It seems likely that this disease is going to give increased trouble in the north, and it will be wise for farmers to make early efforts at control by the extended use of oats in the rotation, and by the elimination of barley grass and spear grass from cultivation paddocks by the occasional long fallow recommended for the north.

Bunt was not noticed in any of the championship crops. There is, however, a very marked tendency to relax precautions in this regard—it is becoming a practice to dust seed in alternate years only. This is to be regretted as there is still an appreciable amount of bunt in the north. I noticed several crops outside the championship class where bunt infestation was heavy, and it must be remembered that an unnoticed trace of bunt in a crop can mean a relatively heavy attack when that seed is sown. Farmers will be well advised to maintain close precautions against this disease by dusting regularly with copper carbonate for some seasons to come.

DETAILS of Awards—Northern Wheat Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Apparent Yield. (One point for every bushel).	Points Awarded. Trueness to Type. (Maximum, 20 points).	Freedom from Disease. (Maximum, 30 points)	Evenness. (Maximum, 20 points).	Condition. (Maximum, 10 points).	*Cleanliness. (Maximum, 30 points).	Total Points
					lb.									
J. Cavanagh, "Springhurst," Curlewis.	Gunnedah ...	Nabawa ...	Scarified January-March	End April	45	4	1,041	40	19	26½	18½	9	26	139
N. S. Richards "The Brigalows," Duri.	Tamworth ...	Ford	Suntyned early January; harrowed springtoothed end February; springtoothed (twice), harrowed early May.	Early May	56	Old land.	...	38	17	28½	18	7½	29	138
A. H. Nixon, "Oakhampton," Upper Manilla.	Manilla ...	Yandilla King ...	Ploughed, 4 to 4½ inches, early February; springtoothed mid-March; harrowed (medium weight) after sowing.	28 March to 12 April	60	Old land.	1,408	35	17	29	18	9	29	137
S. Carberry, "Cadarga," Culgoora.	Narrabri ...	Ford	Springtoothed December and first week February.	Early April.	41	1	...	38	17	29½	18½	9	24½	136½
F. R. King, "Yeral," Bingara.	Bingara ...	Ford, Nabawa ...	Ploughed (disc) end December; springtoothed 10th April.	10 April	50	1	...	39½	17	28½	18	8	25½	136½
Pilditch Bros. "Pretoria," Culgoora.	Wee Waa ...	Ford	Scarified early March; harrowed twice	Early April.	40	2	...	37½	17	29½	18	9½	24½	136
Albert Abbott and S. A. Burt, "Fairfield," Delungra.	Inverell ...	Cleveland ...	Disced and harrowed January; springtoothed and harrowed March.	20 April	38-48	2	...	37	19	28½	18½	7½	25	135½

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

DETAILS of Awards—Northern Wheat Area—*continued.*

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points Awarded. Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum, 20 points).	Freedom from Disease. (Maximum, 30 points).	Evenness. (Maximum, 20 points).	Condition. (Maximum, 10 points).	*Cleanliness. (Maximum, 30 points).	Total Points.
					lb.									
C. Evans, "Hamel," Boggabri.	Boggabri ...	Ford	Springtoothed 1st March	21 April	39	Old land.	...	34	17	28½	18½	9½	27	134½
Read Bros., "Keystone," Delungra.	Delungra ...	Ford	Springtoothed and harrowed January; springtoothed March.	April ...	40	Old land.	...	34½	16	28½	18½	8½	28	134
Cosh Bros. "Karoola." Pallamallawa.	Moree ...	Waratah ...	Ploughed (mouldboard) December; springtoothed and harrowed March; harrowed after sowing.	Early May	50	Old land.	1,222	35	18½	28	17½	8	27	134
R. S. Darby, "Coolanbilla," Spring Ridge.	Tareela Springs.	Nabawa ...	Scarified late December and late February.	Early May	41	6	...	34	18½	29	18	8	26½	134
Scott Bros. "Aberfeldie," Currabubula.	Currabubula	Nabawa ...	Ploughed (mouldboard), 3 to 4 inches deep, on 15th March; harrowed.	6 May ...	45	Old land.	...	33	18	26½	18	8½	29	133
A. S. Penny, "Levuka," Bugaldi.	Coonabarabran.	Nabawa ...	Ploughed (disc) December-January, 5 inches deep; disced March.	Early April.	56	Old land.	1,488	29	18½	29	17½	9½	28½	132
J. E. O'Rourke, "Fairfield," Tambar Springs.	Tambar Springs.	Nabawa ...	Ploughed (disc) early February; springtoothed late March.	Early May	48	2	...	35	18½	29	18	8	23	131½
M. Greenwood, "Walluka," Quirindi.	Quirindi ...	Duri	Scarified February; harrowed after seeding.	Mid-May	43	4	...	30	19	29	17	7½	26	128½

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

Weeds.

Conditions of the past season were very favourable to wild oats, and although some crops were very free of this pest it was, on the whole, rampant. An immense amount of seed will have fallen in cultivation paddocks this year, and it will be wise to adopt measures of control, particularly wherever wild oats were unduly numerous. Summer fallow, except with dangerously deferred seeding, can never be effective in wild oats control, because the seed of this pest does not usually germinate satisfactorily under mild temperatures. Winter fallow with the initial ploughing given early in the winter, with adequate after-tillage and heavy grazing to prevent setting of seed, are necessary completely to clean up oats-foul land; or, in the case of small, heavily-infested areas, the possibility of making silage of the wild oats while still in a very green state might be considered. In either case it will mean losing the use of the land for wheat production for one season, but this will be justified in many northern paddocks after last season.

Western Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

ELEVEN district competitions were conducted in this division, which is an increase of one on the previous year's entries. All the competing crops were of a high standard, as indicated by an average yield of 36½ bushels per acre, which eclipses all previous records in this area. The societies which were represented were Bogan Gate, Cargelligo, Condobolin, Dubbo, Gilgandra, Hillston, Narromine, Peak Hill, Tullamore and Ungarie, and Tullibigeal Agricultural Bureau.

Judging was commenced at Gilgandra on 9th November and completed at Ungarie on 13th November.

The Season.

The following table shows the rainfall registrations at each centre during the fallow and growing periods:—

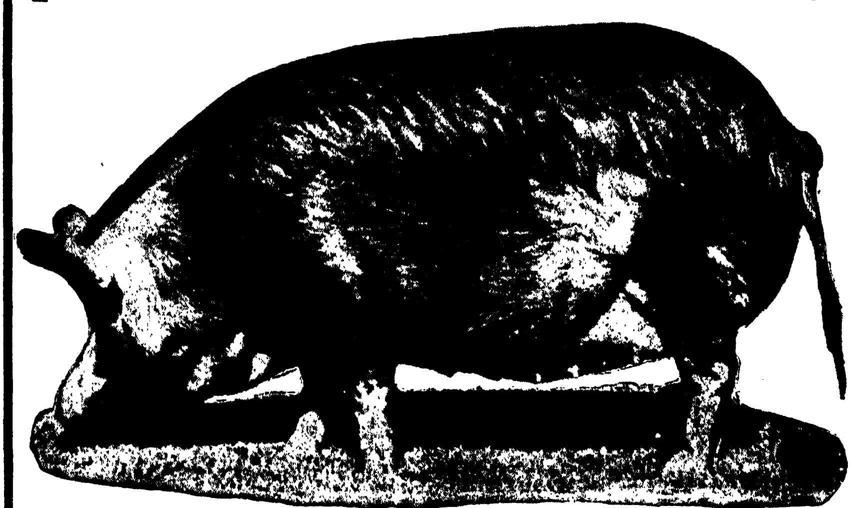
District.	Rainfall (in Points).									Average Rainfall for the Growing Period.
	Fallow Period. (June, 1930, to March, 1931.)	Growing Period.								
		April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.	
Gilgandra ...	2,110	406	523	438	113	23	54	25	1,582	1,236
Dubbo ...	2,233	444	478	404	168	29	87	48	1,658	1,220
Narromine ...	2,602	330	508	342	295	10	60	37	1,582	1,049
Peak Hill ...	2,366	361	569	406	240	34	96	80	1,786	1,154
Tullamore ...	2,020	237	397	365	154	24	115	39	1,331	972
Bogan Gate ...	2,065	211	509	324	177	28	120	50	1,419	1,043
Condobolin ...	1,882	275	527	297	83	49	138	22	1,391	960
Tullibigeal ...	1,718	191	537	304	98	44	134	32	1,340	...
Cargelligo ...	1,954	222	620	362	104	28	114	22	1,472	900
Hillston ...	1,689	196	313	378	88	41	89	59	1,164	879
Ungarie ...	1,922	192	594	428	91	72	131	37	1,525	997

* Mr. Stening judged this championship competition.

DEPARTMENT OF AGRICULTURE

NEW SOUTH WALES

STUD PIGS for SALE



Tamworth Sow, "Inge Viola" (Imp.)

Stud pigs of **BERKSHIRE and TAMWORTH** breeds are available for sale at—

Hawkesbury Agricultural College, Richmond.
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Breeders are reminded that at the above institutions the studs have been augmented by importations of the best and latest strains available of Berkshire and Tamworth pigs from Great Britain.

Full particulars regarding prices, &c., can be obtained on application from the Principal, Hawkesbury Agricultural College, Richmond, or from the managers of the farms mentioned.

G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

The seasonal conditions experienced in this division were the most favourable for the past five years, abundant and at times excessive rains being recorded throughout both the fallow and sowing periods. Chiefly as the result of heavy registrations during the months of October, December, and March, the total rainfall during the ten months, June, 1930, to March, 1931, which constitute the fallow period, was considerably in excess of the average for this period, in most districts exceeding the mean by over 5 inches. The early summer rains were responsible for a prolific growth of weeds on the fallows, and unless the fallows were cultivated early or kept well stocked with sheep the weeds made heavy growth, and it was necessary to resort to the use of the disc cultivator to destroy them.

The rains during March were the heaviest recorded for this month for many years, and provided excellent conditions for sowing. Rains above the average were registered in April; May was one of the wettest months on record, and heavy rains about the middle of this month put a stop to sowing operations. With almost continuous rains during June a resumption of sowing was not possible until July or August, which is much too late for sowing in the districts represented in this division. Early sowing is generally practised, for which the conditions were fortunately favourable, and the area of late-sown crops, in comparison with other parts of the State, was not very great. In most districts the total rainfall during the four months from March to June was over 10 inches in excess of the average for the period.

The spring rains, during the months August, September, and October, were much below average, but the subsoil had been so well saturated with moisture that crops held out remarkably well through the dry spell at the critical stage of growth. The dry spring conditions are regarded as a blessing, as it is almost certain that humid weather would have favoured an epidemic of stem rust. The cool weather and absence of winds during the spring and early summer were of great assistance to the filling of the grain, and excellent yields of good quality wheat were produced.

Some crops were damaged by frost, but in most instances this was the result of sowing early and early mid-season varieties too early.

The Leading Crops.

The prize-winners were:—

1. L. J. Mathews, "Noorla," Condobolin (Condobolin Society).
2. Barry O'Neil, "Baringa," Narromine (Narromine Society).
3. J. Wareing, "Springfield," Tullibigeal (Tullibigeal Agricultural Bureau).

Details of awards and of the cultural methods employed by competitors are shown in the table overleaf:—

DETAILS of Awards—Western Wheat Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops Grown Previously.	Points Awarded. Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum, 20 points).	Freedom from Disease. (Maximum, 30 points)	Evenness. (Maximum, 20 points).	Condition. (Maximum, 10 points).	*Cleanliness. (Maximum, 30 points).	Total Points.
L. J. Mathews, "Noorla," Condobolin.	Condobolin	Nabawa ...	Disc ploughed 3½ inches in June-July; springtoothed March and April.	Mid-April	60	50	Three	40	18½	29	19	8½	26 (27)	141
Barry O'Neil, "Baringa," Narromine.	Narromine...	Nabawa ...	Disc ploughed 5 inches in July; spring toothed October; disced January and February.	Late April	60	Nil.	Very old land.	38	19	29	19	8½	26½	140
J. Wareing, "Springfield," Tullibigeal.	Tullibigeal Agricultural Bureau.	Penny	Disc ploughed 3 inches in June; springtoothed August and February.	Early April.	60	Nil.	Over six.	36	18	28½	19	9	28	138½
R. and A. J. Peters, "Bonnie Doon," Hillston.	Hillston ...	Yandilla King ...	Ploughed 3½ inches in July; springtoothed September and October.	1st & 2nd weeks April.	45	Nil.	Five	40	14	28	19	8½	28 (29)	137½
R. W. S. Hodges, "Harriet Vale," Bogan Gate.	Bogan Gate	Waratah ...	Ploughed 4½ inches in July; springtoothed September; harrowed October; springtoothed January; harrowed March; springtoothed April.	April 26th to 30th.	50	45	Six	38	19	25	18	7½	29	136½
H. J. Harvey, "Kindalin," Rawsonville.	Dubbo ...	Waratah ...	Scarified 3 inches in September; scarified December, and in early April.	April 24th to 26th.	60	Nil.	Very old land.	36	18½	28	17	8	29	136½
A. Haub, "La-dell," Ungarie.	Ungarie ...	Nabawa ...	Scarified 2½ to 3 inches early in October; scarified March.	1st week May.	50	35	Old land.	35	19	28	18	8	28	136
P. Fallon, "Nilma," Curban.	Gilgandra	Nabawa ...	Ploughed 3½ inches in July–August; springtoothed September; disced January; springtoothed March.	Late April.	55	36	Old land.	31	18	29	18	9	29	134
J. Duncan, "Thornycroft," Peak Hill.	Peak Hill ...	Turvey	Ploughed 4 inches in September; harrowed October; disced January; springtoothed March.	1st week. April.	58	Nil.	Very old land.	36	17½	26	17	8	29½	134
W. E. Jones, "Alawah," Tullamore.	Tullamore	Nabawa ...	Disc ploughed 3 inches in July; harrowed after ploughing; springtoothed September; harrowed October; springtoothed December and in January.	2nd week April.	50	50	Two	34	17	29½	19	9	25½ (26)	134
J. A. Reberger, "Travailler," Cargelligo.	Cargelligo	Turvey	Ploughed 4 inches in August; springtoothed and harrowed September; springtoothed before sowing; harrowed after sowing.	1st week April.	60	Nil.	Three	38	16	29	16	7	26½ (27)	132½

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses is shown the maximum if below 30.

Following on his previous year's success as runner-up in the championship, much credit is due to Mr. Mathews in achieving this time the highest distinction. His crop of Nabawa was the fourth crop grown on the land, which was a light red loam originally timbered with box, pine, and buddah. The estimated yield when judged was 40 bushels per acre: being tall and fairly dense, the crop was a little tangled in patches; the ear development was particularly good, a fair proportion of the ears being three grains wide, which is not very usual with this variety. Although a few Waratah strangers were present, the crop was up to pure seed standard, and a trace of flag smut and a little loose smut were the only diseases present. Except for a very occasional wild oat and wild mustard plant, the crop was free from weeds.

The second prize crop, also of the Nabawa variety, was dense and well headed, with a prospective yield of 38 bushels at the time of judging. It was produced on land that had been under cultivation for about thirty years, and yet the crop was so heavy that it was rather tangled and had lodged in a few small patches. The crop was very pure, and disease was limited to a little leaf spot (septoria) and a trace of loose smut. The only factor to mar an otherwise excellent crop was the presence of weeds in the form of wild oats, wild mustard, and Mexican poppy.

Tullibigeal Agricultural Bureau has been a consistent supporter of these competitions through a series of bad seasons, and its success this year is gratifying. It was a crop of Penny, grown on a deep red loam, that secured third place for Tullibigeal. It was dense and well headed, except in patches which had been thinned as the result of erosion by heavy rains, and at time of judging it was estimated to yield an average of 36 bushels per acre. There were a few plants of Federation to mar the purity, and a little flag smut and leaf spot were also present; wild mustard and an odd wild oat were the only weed growth.

Special mention must be made of the excellent crop at Hillston which filled fourth place in the awards; it was a dense well-headed crop of Yandilla King, estimated to yield 40 bushels per acre, and remarkably free from weed growth. It is unfortunate that a severe cut in points for purity was necessary owing to admixture of other varieties; but for this the championship would have gone to Hillston.

Lessons from the Season.

Fallowing.—Intelligent attention has been given by all competitors to the management of the fallows. Most of the fallows were ploughed early (in June or July), and in almost all cases the ploughing was shallow—only 3 to 3½ inches. The greater proportion of the soils in this division are deep loams without any retentive clay subsoil, and best results are obtained when they are regularly ploughed shallow; in the course of a few years a finely compacted layer is formed just below plough-depth, which should not be disturbed. The chief value of the cultivations of the fallow in a season of such superabundant rains is in the destruction of weeds, which not only continually pump up the moisture conserved in the soil

as a result of the fallowing, but they utilise the plant food rendered available by the process.

Varieties.—Nabawa was the most successful variety in the competition, winning both first and second prizes and being represented in more entries than any other variety. This is the third year in succession that Nabawa has filled the two leading places in the championship competition in this division, and such an excellent performance stamps it as the most suitable variety for the climatic conditions experienced in the western wheat area. The success of Nabawa in these competitions has been largely responsible for a phenomenal increase in its popularity, for within the space of three years it has become, by a very large margin, the most extensively grown variety in this part of the wheat belt. An error was made by some farmers in sowing this variety too early, and in consequence the crops were damaged by frost. It is an early mid-season wheat with fairly weak straw, and should not be sown before the third week in April in these districts.

The seasonal conditions were very favourable for the production of high yields by late-maturing varieties, as shown by the yields of Penny, Yandilla King, and Turvey. While any one of the three varieties mentioned is useful for sowing during the first couple of weeks in April, especially if the seed-bed is moist at this time, it is, however, inadvisable to sow large areas with late-maturing varieties in these districts of normally low rainfall.

Waratah has maintained its consistency as a high-yielding early-maturing variety; no other early maturer succeeded in winning a local competition. Owing to its susceptibility to flag smut and liability to shed, it has been superseded to a large extent by Nabawa, which is not a great deal later in maturity.

Seeding Operations.—The period of sowing for the competing crops was from the first week in April to the first week in May. In average seasons mid-April to mid-May is the optimum period for sowing in these districts, but it may be taken as an axiom that when good rains are experienced early in the autumn, the best results are obtained from crops which are sown early. The rates of seeding varied from 45 lb. to 60 lb. per acre, the three prize-winning crops being sown at the latter rate. These may be accepted as the most satisfactory limits as regards the quantity of seed to be sown in these districts.

Fertilisers.—The quantity of superphosphate varied from 36 lb. to 50 lb. per acre, the champion crop being manured with the heavier dressing, but the outstanding feature of this competition was that more than half the competing crops did not receive an application of superphosphate, including the second and third prize-winning crops. The success of crops sown without fertiliser was due to the very favourable season, especially the excellent autumn conditions, which favoured an early germination and rapid growth of early-sown crops. As no control plots were sown with superphosphate, there was nothing to indicate that these crops, although they were of such a high standard, would not have yielded even better with an application of superphosphate; in fact, on experiment plots on the property of one of

the competitors, a plot manured with superphosphate at the rate of ½ cwt. per acre was estimated to yield at least 6 bushels per acre more than the unmanured plot. As there is a possibility that the success of unmanured crops this season may influence growers to dispense with fertilisers when sowing their crops next autumn, it is well to emphasise that to persist in this practice under normal seasonal conditions would be most uneconomical, and in seasons of low rainfall it would be courting disaster.

Diseases.—On the average, the crops were comparatively free from disease. The large proportion of the wheat area that is sown with Nabawa is having a beneficial effect in reducing flag smut infection. While it was necessary to search carefully through the crops of Nabawa for any trace of flag smut, the infection was quite prominent in a crop of Waratah and in one of Turvey, both of which are susceptible to the disease.

Foot-rot and loose smut were prevalent, and a couple of crops were infected with stem rust. Fortunately, the cool dry weather that was experienced in the spring was not favourable for the development of the rust fungus.

Central Slopes Area.

E. S. CLAYTON, H.D.A., Senior Experimentalist.*

FOURTEEN districts competed in the Central Slopes Area Field Wheat Championship this season, and the crops were of exceptional quality, five being estimated to yield 39 bushels per acre or more. The average yield of the whole of the crops in the competition was 35 bushels. The competing districts were:—Bribbaree, Canowindra, Cowra, Cudal, Cumnock, Dunedoo, Eugowra, Forbes, Grenfell, Mendooran, Molong, Parkes, Quandialla, and Wellington.

The Season.

The following table gives the rainfall registrations at various centres:—

RAINFALL.

District.	On the Fallow.	Growing Period.							
		April.	May.	June.	July.	August.	September.	October.	Total.
	points.	points.	points.	points.	points.	points.	points.	points.	points.
Canowindra ...	1,418	437	398	328	157	95	189	95	1,699
Cowra	1,751	222	451	370	208	180	162	109	1,702
Cudal	2,330	312	436	374	158	92	220	96	1,688
Cumnock	1,502	114	577	570	206	66	143	76	1,752
Dunedoo	1,365	407	382	307	80	53	48	59	1,336
Eugowra	1,353	55	522	215	139	67	179	40	1,217
Forbes	1,600	55	522	215	139	67	179	40	1,217
Grenfell	1,486	391	590	439	228	103	164	90	2,005
Mendooran ...	1,421	404	320	313	92	37	58	41	1,265
Molong	1,900	164	585	447	119	50	177	56	1,598
Parkes	1,502	245	454	361	215	29	70	60	1,434
Wellington ...	1,974	309	586	500	204	65	112	72	1,848

* Mr. Clayton judged this championship competition.

Good autumn rains were experienced in 1931. The March rainfall ranged from 3 to 5 inches, which was very satisfactory, and the fallows were in consequence well supplied with moisture. This was a very fortunate circumstance, as it enabled the fallows to be cultivated and sown early. As it turned out, only early-sown crops yielded satisfactorily, and much of the success of cropping operations this year was due to the favourable autumn rains which made possible the early sowing of the crops. Early May, which is the normal mid-season sowing period in many localities, saw the advent of very wet weather which continued through June and July, and rendered it almost impossible to sow any more wheat. Crops that were not sown in April and early May could not be sown until August, which is altogether too late. Crops sown so late need an exceptionally protracted and favourable spring, and as such weather is seldom experienced, these very late sown crops almost invariably fail.

Crops that were sown early and germinated before the very heavy winter rain grew well and withstood the wet conditions. The soil was saturated with moisture to a great depth, and with the advent of warm weather in the spring the crops grew very satisfactorily.

In August and September favourable weather was experienced, but the rainfall was scanty during October. There was, however, a general absence of hot dry scorching winds in October, and the good reserve of moisture in the soil was sufficient to carry the crops over this comparatively dry month and enable them to mature a very good plump grain, and also to produce, in the main, very heavy yields. In November heavy rain was experienced. This was too late to benefit any but very late-sown crops; in fact, it occasioned some damage to heavy-headed tall crops, causing some of them to lodge, though not sufficiently to render them difficult to harvest with modern machinery.

Generaly speaking, the season was very favourable, as indicated by the heavy yield obtained throughout the district. It definitely demonstrated the advantages of sowing early when the autumn is favourable.

The Leading Crops.

The prize-winners were:—

1. C. D. Brown and R. Eve, "Bolan Vale," Bland (Quandialla Society).
2. E. J. Johnson, "Iona," Gunningbland (Parkes Society).
3. H. J. Balcomb, "Teekoona," Toogong (Cudal Society).

The details of the awards and of the methods of cultivation of each competitor are shown in the table on pages 96 and 97.

Messrs. Brown and Eve, of Quandialla, won the championship with a particularly good crop of Yandilla King, which was estimated to yield 41 bushels per acre—the highest yield in the competition. In addition to promising a very heavy yield, the crop was excellent so far as pureness of seed was concerned, was clean and free from weeds, and showed no flag smut. It was very dense and even, with heavy well-filled heads. The soil was heavy black self-mulching which had originally carried Belar and box timber, and was typical of the heavy soils of the Bland.

Yandilla King certainly suits the heavy black self-mulching soils, especially when sown early. As a matter of fact, these soils should always be sown early in the season, as it is impossible to cultivate or sow them once the weather really sets in wet, as in a drooping winter. To permit of this early sowing, a late maturing variety must be used, and under these conditions Yandilla King is particularly suitable.

Mr. E. J. Johnson, of Gunningbland, won second place with a heavy yielding crop of Bobin. It was growing on a fertile self-mulching chocolate-coloured loam that had originally carried Myall timber, and which had been under oats for green feed prior to the competition crop. Mr. Johnson deserves great credit for the production of such a heavy and attractive crop. The soil is fertile and of a heavy nature, and on such soils black oats are very prolific and difficult to control. The cleanliness of the crop was sufficient proof of the effectiveness of the control methods adopted. Thorough cultivation in March and April germinated and destroyed most of the oats, and created an ideal condition for the wheat, which enabled the crop to smother out any black oats that germinated later.

The crop was well up to pure seed standard, and was estimated to yield 39 bushels per acre. Such a heavy yield is remarkable in view of the low rainfall received in August, September, and October. These are three very critical months, and the crop would have suffered had it not been for the careful preparation and the retentive nature of the soil, which enabled a good reserve of moisture to be held over for the use of the crop during the spring.

A very clean crop of Yandilla King and Turvey won third place for Mr. H. J. Balcomb, of Toogong. It was grown on a medium red loam which had originally carried box timber. The type and purity of the crop were very good, and it was also extremely clean and free from oats and weeds. It promised a yield of 37 bushels per acre.

The Varieties.

Yandilla King was this year the outstanding variety in the competition, and some heavy yielding crops of it were inspected. Five of the fourteen crops were of this variety, and it filled first, third, and fourth places, and again demonstrated its great adaptability and heavy yielding qualities. The Central Slopes district, generally speaking, is suitable for the growing of late-maturing varieties, and this season, when only early-sown crops grew well, was particularly favourable to early-sown late-maturing varieties. In this class Yandilla King is hard to beat. It does well on medium textured as well as on heavy soils, and provided it is sown early it is very adaptable so far as climate is concerned. The variety is sometimes inclined to "tip"—or hay off—in a dry spring, but this season this defect was hardly noticeable in spite of the dry spring. It showed very little flag smut or leaf spot, and in a year when frost damage was prevalent it showed only slight damage.

DETAILS of Awards—Central Slopes Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops Grown Previously.	Points Awarded. Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum, 20 points).	Freedom from Disease. (Maximum, 30 points)	Evenness. (Maximum, 20 points).	Condition. (Maximum, 10 points).	*Cleanliness. (Maximum, 30 points).	Total Points.
					lb.	lb.								
C. D. Brown and B. Eve, "Bolanvale," Bland.	Quandialla	Yandilla King ...	Mouldboard ploughed August, 3 inches deep; springtoothed September and again in March. Sown with combine.	15 April...	50	60	Old land.	41	19	28	17	6½	28½	140
E. J. Johnson, "Iona," Gunningbland.	Parkes ...	Bobin	Previous oat stubble disced in September; harrowed January; scarified January, February, and March; springtoothed March and twice in April. Sown with combine.	6 May ...	60	60	"	39	18½	27	19	6	29	138½
H. J. Balcomb, "Teekoona," Toogong.	Cudal ...	Yandilla King and Turvey.	Mouldboard ploughed July, 4½ inches deep; harrowed December; springtoothed January and March; harrowed prior to sowing in April. Sown with combine.	10 April...	70	56	"	37	19	27	18	7	29	137
F. W. Harding, "Redlands," Billimari.	Cowra ...	Ford	Mouldboard ploughed September; sundercut January; springtoothed January, and again in March.	20 " ...	60	50	"	40	17½	28	19	7	25	136½
J. H. Durham, "Bonnie View," Grenfell.	Grenfell ...	Yandilla King ...	Mouldboard ploughed August, 4 inches deep; springtoothed February, and again in April.	16 " ...	60	60	"	39	18	26½	17	8	27½	136
B. J. Kupkee, Wowingragong, Forbes.	Forbes ...	Bena	Disc ploughed June; springtoothed July, September, November, and February. Sown with combine.	16 " ...	60	30	"	40	17	26	19	8	25	135
M. W. Clemens, "Glenisla," Forbes-road, Eugowra.	Eugowra ...	Waratah ...	Disc ploughed June, 4 inches deep; harrowed July; springtoothed August; sundercut January; harrowed January; springtoothed March and April. Sown with combine.	21 " ...	66	45	"	35	17	27	19	8	29	135

DETAILS of Awards—Central Slopes Area—continued.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Super-phosphate per acre.	Number of Crops Grown Previously.	Points Awarded. Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum, 20 points).	Freedom from Disease. (Maximum, 30 points).	Evenness. (Maximum, 20 points).	Condition. (Maximum, 10 oints).	*Cleanliness. (Maximum, 30 points).	Total Points.
					lb.	lb.								
C. W. Reid and Son. "Killamont," Molong.	Molong ...	Waratah ...	Mouldboard ploughed August, 4½ inches deep; springtoothed and harrowed February, and again in March. Sown with combine.	25 April..	53	56	Old land.	35	19	26	17½	8½	26	132
C. G. Watt, "Fairy Mount," Baldry.	Cumnock ...	Waratah and Yandilla King.	Mouldboard ploughed June, 4 inches deep; disced October; springtoothed February; harrowed March; springtoothed March. Sown with combine.	25 " ...	60	50	"	34	19	27	17	7	25	129
G. F. Knight, "The Pines," Bribbaree	Bribbaree ..	Nabawa ...	Mouldboard ploughed July, 3 inches deep; springtoothed February. Sown with combine.	15 " ...	60	28	1st crop.	36	17	28	17	7½	23	128½
A. J. O'Brien, "Allengrove," Suntop.	Wellington	Ford and Nabawa.	Rigid tine scarified August, 3 inches deep; again in October and March. Sown with combine.	1 May ...	67	50	Old land.	29	18	28	17	9	26	127
S. E. Nash, "Wollombeen," Lockwood, Canowindra.	Canowindra	Yandilla King ...	Disc ploughed March, 3 inches deep. Sown with oats in April; eaten off in June. Mouldboard ploughed, 4 inches deep, October; harrowed December; springtoothed December and January. Sown with combine, and harrowed.	6 April...	65	56	"	32	17½	26	17	5	27	124½
L. G. Burke, "Durrie," Birriwa.	Dunedoo ...	Nabawa ...	Mouldboard ploughed September, 4 inches deep; springtoothed January and March.	15 " ...	60	60	"	28	17	27	15	8	25	120
O. R. Gavin, "Annaville," Mendooran.	Mendooran	Nabawa ...	Mouldboard ploughed, 4 inches deep, July; springtoothed November and February; ploughed, 2 inches deep, March; harrowed and then sown with combine.	5 May ...	56	No manure.	1st crop.	26	17	27	16	8½	22	116½

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

Yandilla King is remarkably suitable for early sowing on the heavy black self-mulching soils, and in fact on any of the very heavy soils which must be sown early. On such soils it is courting disaster to delay sowing, and a late-maturing variety must be used. The outstanding success of this variety on the heavy Bland soil on Messrs. Brown and Eve's property at Quandialla should be sufficient to recommend it to others on similar country.

Bobin produced a very satisfactory and heavy yielding crop at Parkes on fertile chocolate loam of heavy texture. The heads were long and well filled, but the variety showed traces of foot-rot, flag smut, leaf spot, and loose smut. It certainly possesses drought resistant qualities, and is capable of very heavy yields.

A 40-bushel crop of Ford was produced at Cowra. This was an attractive crop, very free from disease, and even in height and density. At Wellington, also, a very satisfactory crop of this variety was inspected. It promises to become very popular in parts of the Central Slopes wheat area.

Bena yielded well in the competition at Forbes. It was remarkably well headed, and promised a 40-bushel yield. This variety, although occasionally giving remarkably high yields, seems to demand good conditions all through the growing period, and does not seem to possess the wide soil and climatic adaptability of some of the outstanding varieties, or to be quite so drought resistant.

Waratah again yielded well, and won three of the local competitions. It is very suitable for the area, but the season favoured only early-sown crops, and as Waratah is generally sown later in the season, it encountered the abnormally wet winter conditions. In such a year it was surprising to see Waratah do so well and furnish further proof of its remarkable adaptability.

Nabawa is only a little later maturing than Waratah, and therefore suffered from the same seasonal disadvantages. It again demonstrated its great adaptability, disease resistance, and heavy yielding qualities. Nabawa is rightly gaining in popularity, and is proving very suitable for both medium and heavy soils in the Central Slopes area.

Comments.

The competitors must be complimented on the clean crops—striking proof of careful soil preparation. The plentiful rains of the autumn were most useful in germinating rubbish on the fallows, and thorough cultivation at this time destroyed the weeds and ensured good conditions for the wheat crop. Sheep were grazed on all the fallows and materially assisted in keeping them clean and in consolidating the seed-bed.

The rigid tine scarifier is being used more than formerly in this district. It is not only efficient in destroying weeds, but it also greatly assists in bringing about a uniform compaction of the seed-bed below the surface of the soil. The combine is also continuing to increase in favour, and was used for sowing most of the winning crops. It not only speeds up the sowing—a great advantage when a large area has to be sown—but it also saves moisture, and enables the weeds to be destroyed, the soil to be cultivated.

and the seed sown in one operation. Such a year as this, when only a short sowing season was experienced and crops had to be rushed in, and when those not sown early could not be sown because of the excessive wet, showed the advantages of the combine. It is a good practice either to attach light harrows behind the combine or to harrow the land immediately after sowing. This ensures the thorough covering of the seed.

Late frosts were experienced throughout the district, and slight damage to the heads was everywhere noticeable. There was very little disease; flag smut was not as noticeable as usual, foot-rot and leaf spot were present, but not to any appreciable extent, but loose smut was particularly prevalent this year and was to be seen in all crops. Bunt was thoroughly controlled by the dry copper carbonate seed treatment, and rust was only noticeable on the flag to a very minor extent.

The Southern Slopes Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

CONSIDERING the very abnormal season experienced in south-eastern wheat districts, the result of the championship in the Southern Slopes Division greatly exceeded anticipations. The average yield of the eleven competing crops was over 34¾ bushels, which is remarkable, considering the excessively wet conditions during the early part of the growing period. However, the general average yield of this part of the wheat belt will be considerably below this, owing to the large proportion of crop which was sown very late.

The district societies which conducted local competitions were Albury, Boorowa, Corowa, Coolamon, Cootamundra, Henty, Murrumbidgee (Wagga), Murrumburrah, Temora, The Rock (Farmers and Settlers' Association), and Young. Judging was commenced at Wagga on the 30th November and completed at Cootamundra on 4th December.

The Season.

The following table gives a comparison of the rainfall registrations in the different districts.

RAINFALL Table.

District.	Fallow Period (June, 1930, to March, 1931).	Growing Period.								Average Rainfall for the Growing Period.
		April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.	
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Albury	3,100	292	621	833	238	358	171	179	2,692	1,875
Boorowa ...	2,417	394	670	513	172	162	195	103	2,209	1,381
Corowa	2,414	247	546	654	197	183	116	161	2,104	1,326
Coolamon ...	2,441	262	580	668	95	110	159	59	1,933	1,273
Cootamundra ...	2,446	257	736	668	102	133	163	34	2,093	1,485
Henty	2,786	302	627	997	199	164	178	107	2,574	1,453
Wagga	2,657	234	609	740	152	107	203	41	2,086	1,383
Murrumburrah	2,331	290	265	786	183	169	252	60	2,005	1,462
Temora	2,185	415	635	648	159	106	107	50	2,120	1,257
The Rock ...	2,581	245	536	737	182	125	197	115	2,137	1,341
Young	2,657	439	721	788	246	154	224	100	2,672	1,585

* Mr. Stening judged this championship.

Throughout the wheat-growing districts situated on the southern slopes, the 1931 season will be memorable on account of the magnitude of its rainfall. The precipitation during the effective growing period eclipsed all previous records, exceeding the mean by 8 to 9 inches in the southernmost districts. Excessive rains were also experienced during the fallow period, chiefly during the months of October, December and March, and the total for the period exceeded the average in some districts by as much as 11 inches. It was the superabundance of rains during the months March to June which had the most disastrous effect: in some districts the falls totalled as much as 26 inches for the four months, or more than three times the normal registration for the period, considerably hindering seeding operations and causing a total suspension about the middle of May, which, as a rule, is the main sowing month in these districts. As a result, large areas of land were either left unsown or were sown much too late, frequently under unsatisfactory soil conditions. Even the early-sown crops suffered as the result of the excessive rains, especially when in situations subject to waterlogging, the growth of the crops being greatly retarded and stooling sparse, allowing an opportunity for weeds to flourish. The registrations during the months July to September were a little below normal and October was a very dry month, but an exceptionally cool and protracted spring was very favourable to the final development of the crops and aided in the production of very satisfactory yields.

The Leading Crops.

The prize-winners were as follows:—

1. J. D. Crowley, "Victoria Park," Old Junee (Temora Society).
2. H. C. Thackeray, "Makari," Young (Young Society).
3. N. J. Bird and J. Kennedy, "Boorool," Balldale (Corowa Society).

Details of awards and of the cultural methods of every competitor's crop are shown in the accompanying table.

The championship was won by a very well-headed crop of Nabawa, estimated to yield 39 bushels per acre, which was produced on an undulating red loam which was originally timbered with grey and yellow box. It was the purest crop of Nabawa inspected this season, and its purity was the result of the care taken in roguing all strangers from the previous crops harvested for seed purposes. Not over tall, it was comparatively safe from any damage, and disease was limited to a little foot-rot, septoria and loose smut. The presence of weeds, however, detracted from an otherwise excellent crop, saffron thistle, wild mustard and skeleton weed being in evidence.

The crop awarded second place was also of the Nabawa variety, estimated to yield 39 bushels per acre, but it failed to reach the standard for pure seed. There were very few weeds considering the land had been in cultivation for a considerable period, but an appreciable infection of leaf spot and foot-rot was in evidence.

The third prize was won by a fairly dense crop of Bena with large heads, well filled with grain of good sample; it, however, was rather patchy and thinned out considerably in one portion. The presence of purple

straws and white heads cost a reduction of points for purity, and there was an infection of leaf spot and stem rust as well as a little flag smut. The crop scored well for freedom from weeds, only a very occasional wild oat being present.

Lessons from the Competition.

Cultural Methods.—The main factor responsible for the very satisfactory yields was the high standard of farming. Of the seven crops which yielded over 36 bushels, six were grown on fallows ploughed early, that is, not later than July (the exception was on fallow ploughed in August) and cultivated in the early spring. In a season of such superabundance of rain, the better results from crops grown on well-fallowed land cannot be due to the additional moisture that has been conserved in the fallow, but is attributed to the increased production of nitrates during the period the land is in fallow, the extra supply of nitrates being particularly advantageous in such a wet season. Another benefit that is derived from fallowing in a wet year is the control of weeds, which take their toll of the available plant food.

The satisfactory destruction of weed growth was rendered difficult by reason of the frequent rains in the autumn, for the surface soil was rarely sufficiently dry to allow cultivation to do more than merely transplant the weeds; in consequence, the chief marring feature of some of the competing crops was an infestation with weed growth. Saffron thistles, which were rather prevalent, are regarded as one of the worst intruders in a wheat crop, as the ripe seed is about the same size as the wheat grains and cannot be separated by grading, and detracts from the sample both for seed purposes and for milling. Another weed which is becoming much too prevalent in some of the districts in this division is skeleton weed. Experiments have demonstrated that this deep-rooting weed can be destroyed by spraying with sodium chlorate, and when infestations are not heavy its spread should be prevented by this means.

Varieties.

The success of Nabawa in occupying the two leading positions in the awards is rather surprising, as this variety does not give of its best under very wet conditions. These two crops, however, were in well-drained situations. The variety has proved rather disappointing this season when grown on land at all subject to waterlogging.

Bena has signalled its return to these competitions after an interval of two or three years, by filling third place. The crop, however, showed some variation in type, for which reason this variety was withdrawn from recommendations; when seed of satisfactory type is distributed, there is no doubt that it will again be recommended for this portion of the wheat belt, where it is particularly suitable.

Yandilla King has demonstrated its consistency as a bag-filler in these districts by winning five of the eleven local competitions conducted in this division, and its failure to secure a place in the championship was due

DETAILS of Awards—Southern Slopes Wheat Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops Grown previously.	Points Awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type. (Maximum, 20 points.)	Freedom from Disease. (Maximum, 30 points.)	Evenness. (Maximum, 20 points.)	Condition. (Maximum, 10 points.)	*Cleanliness. Maximum, 30 points.)	Total Points.
					lb.	lb.								
J. D. Crowley. "Victoria Park," Old Junee.	Temora ...	Nabawa ...	Ploughed 5 inches July; harrowed September; springtoothed twice November; springtoothed January and April.	First week May.	65	60	7	39	19½	28½	19	9½	25	140½
H. C. Thackeray, "Makari," Young.	Young ...	Nabawa ...	Ploughed 3½ inches July; harrowed September; scarified November, January, and March; lightly fed-off end July.	First week May.	60	56	Very old land.	39	17	26	18	9	29	138
N. J. Bird and J. Kennedy, "Boorool," Balldale.	Corowa ...	Bena	Ploughed 4½ inches July; harrowed August; scarified October; harrowed December; scarified February.	First week April.	60	60	6	37	17	27	18	9	29	137
L. Oehms. "Lauriston," Old Junee.	Wagga ...	Waratah ...	Disc-ploughed 3½ inches April; scarified and harrowed August; disced November; springtoothed May.	5 May ...	65	90	Very old land.	38	19½	27	19½	9	20	133
W. Armstrong, "Lauraville," Winchendon Vale.	Coolamon ..	Yandilla King ...	Ploughed 4 inches May; harrowed July; disced August; scarified October; part scarified and part springtoothed February.	Second week May.	60	45	Very old land.	39	14	25	19	9	26	132
J. Mathews, "Wandilla," Bulgandra.	Albury ...	Yandilla King...	Ploughed 4 inches August; scarified October; scarified March.	Last week April.	75	60	6	38	19	26	15	8	26	132

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

DETAILS of Awards—Southern Slopes Wheat Area—*continued*.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quanty of Superphosphate per acre.	Number of Crops Grown previously.	Points Awarded. Apparent Yield (One point for every bushel.)	Trueness to Type. (Maximum, 20 points.)	Freedom from Disease. (Maximum, 30 points.)	Evenness. (Maximum, 20 points.)	Condition. (Maximum, 10 points.)	*Cleanliness. (Maximum, 30 points.)	Total Points.
					lb.	lb.								
L. B. Boxsell, "Cherry Grove," Cullinga.	Cootamundra.	Yandilla King...	Ploughed 3 inches June; springtoothed October; scarified November; springtoothed January; scarified February, and twice in April.	Last week April.	60	60	Very old land.	27	18½	27	19	9½	28	129
Smith Bros. and W. Bunyan, "Smithfield," Cookardinia.	Henty ...	Turvey	Ploughed 4½ inches September; harrowed after ploughing; disced February.	Second week May.	60	40	Very old land.	30	18	28	18½	8	23	125½
F. C. Clark, "Bonnie Doon," Boorowa.	Boorowa ...	Nabawa (20 ac.), Federation (20 ac.), Waratah (10 ac.).	Ploughed 4½ inches September; springtoothed November; scarified February; crop fed-off to mid-August.	Second week April.	58	30	Very old land.	26	17	26	18	9	29	125
J. C. Graham and R. and V. Bradford, "Strathdoon," Nubba.	Murrumburrah.	Yandilla King ...	Ploughed 4½ inches August; harrowed September; springtoothed October; springtoothed and harrowed March.	Last week April.	63	50	First crop since land spelled for five years.	31	18	27	17	9	21	123
W. Bowyer, "Kincora," Tootool.	The Rock ...	Yandilla King...	Ploughed 4½ inches June; harrowed twice August; springtoothed October; springtoothed late February; harrowed after sowing.	End April	60	45	First crop since land spelled for six years.	39	16	27	16	7	16	121

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

to factors other than yield. Over a number of years this variety has proved the most successful in this part of the wheat belt.

Waratah is the only early-maturing variety which appeared in this competition, and in spite of its defect of susceptibility to flag smut it still maintains its consistency as a yielder.

Seeding Operations.

The time of sowing varied from the first week in April to the second week in May, after which sowing was completely suspended for a couple of months owing to the boggy condition of the soil. Many farmers resumed sowing in August, but such late sowing is regarded as too much of a gamble, as exceptionally favourable conditions are required to ensure the production of payable yields; it would be preferable to allow the land to fallow for the subsequent season's crop.

Rates of sowing ranged from 58 lb. to 75 lb. per acre, with an average of 62½ lb. per acre, which is about 6 lb. per acre less than the average in previous years' competitions. This decrease is due, no doubt, to the fact that no late sown crops were represented in the competition, for which heavier rates of seeding are required.

The applications of superphosphate varied from 30 to 90 lb. per acre, with an average of 54 lb. per acre, which is a material decrease of 27 lb. per acre on the average applications in previous years. The necessity for economy on account of the prevailing financial difficulties was the main reason for the lighter applications. If it can be afforded, the quantity of superphosphate applied to crops in this division should not be less than 56 lb. per acre, and the amount should be increased for late-sown crops.

Diseases.

Wet seasons are usually favourable for disease attack, and the present one was no exception.

The most prevalent fungous disease was foot-rot, and there was not one crop in the competition which escaped infection, and in a few instances it accounted for an appreciable toll of the yield. Previous observations that the "feeding off" of a crop may increase the amount of damage by foot-rot were confirmed; one crop of Nabawa which had been "fed off" to mid-August was so badly infected as to reduce the yield by approximately one-third. Flag smut was not so much in evidence as in previous years, no doubt as the result of the seed-beds being well compacted by rains. The wet conditions were favourable for the development of leaf spot (*Septoria tritici*), which had affected the ears, causing a reduction in yield. Take-all was also observed in some crops. The measures of value for the control of these four diseases mentioned are similar, namely, burning of the stubble and rotation with oats.

The severe infection by loose smut this season calls for the adoption of precautions to minimise further losses from this disease. Stem rust made its appearance in a few crops, but fortunately the crops were too far advanced in maturity to suffer damage.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	... Messrs. Coppleson and Kelly, Wee Waa.
Bald Early ...	... Manager, Experiment Farm, Trangie.
Baringa	... Mr. L. D. Bryant, "Glencoe," Ungarie.
Baroota Wonder	... Manager, Experiment Farm, Trangie.
Bobin	... Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
	Mr. E. H. G. Eldershaw, "Kywong," Old Junee.
	Mr. W. E. Ditchfield, "Strathmerton," West Wyalong.
	Mr. D. W. Edis, "Prestonville," Ariah Park.
	Mr. R. Penfold, Quandialla.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
Duri	... Mr. M. Greenwood, Spring Ridge Road, Quirindi.
Geeralying ...	... Mr. J. Parslow, "Cooya," Balladoran.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
Gresley	... Manager, Wagga Experiment Farm, Bomen.
Gullen	... Mr. J. Parslow, "Cooya," Balladoran.
Nabawa	... Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	Messrs. Coppleson and Kelly, Wee Waa.
	Mr. J. Parslow, "Cooya," Balladoran.
	Mr. E. H. G. Eldershaw, "Kywong," Old Junee.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
Riverina	... Manager, Experiment Farm, Trangie.
Union	... Manager, Wagga Experiment Farm, Bomen.
Waratah	... Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
	Mr. R. M. Gelling, "Cooinoo," West Wyalong.
	Mr. Smith Pollock, "Glengarry," Quirindi.
	Messrs. Coppleson and Kelly, Wee Waa.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
Yandilla King ...	... Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	Mr. E. H. G. Eldershaw, "Kywong," Old Junee.
Zealand	... Manager, Wagga Experiment Farm, Bomen.

Oats—

Algerian	... Manager, Experiment Farm, Bathurst.
	Mr. C. Bennett, " Theole," Forbes-road, Cowra.
Belar	... Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
	Mr. C. Bennett, " Theole," Forbes-road, Cowra.
	Mr. C. W. Buckland, " Kangetong," Ootha.
Buddah	... Manager, Experiment Farm, Trangie.
Gidgee	... Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
Guyra	... Manager, Experiment Farm, Bathurst.
	Manager, New England Experiment Farm, Glen Innes.
	Messrs. Walker Bros., Wattamondara.
Mulga	... Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
	Mr. C. Bennett, " Theole," Forbes-road, Cowra.
	Mr. C. W. Buckland, " Kangetong," Ootha.
Palestine	... Mr. C. W. Buckland, " Kangetong," Ootha.
Sunrise	... Manager, Experiment Farm, Trangie.

Tomatoes—

Improved Sunnybrook Earliana ...	... Mr. Albert Sorby, Macquarie Fields.

Cucumbers—

Early Fortuna ...	... Mr. W. Parry, Terrigal.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6,200
Swane Bros.	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

C. G. Savage, Director of Fruit Culture.

Foot-rot of Cereals.

OBSERVATIONS ON THE DISEASE IN NEW SOUTH WALES.

H. J. HYNES, M.Sc., B.Sc.Agr., Senior Assistant Biologist.

IN the course of an extended investigation on foot- and root-rot diseases of cereals in this State, numerous organisms* have been found in association with the roots and stem-bases of affected plants. In general, however, the major diseases in this complex group are those caused by three distinct parasitic fungi—foot-rot (*Helminthosporium sativum*), take-all (*Ophiobolus graminis*), and fusarium root-rot (*Fusarium* sp.). In each of these diseases the causal organism is a soil-inhabiting form which attacks the roots and stem-bases of various cereals and grasses; all three fungi may, in certain cases, be found on the one plant. Altogether these diseases constitute an important problem to wheat-growers, and in certain seasons the losses sustained are quite serious.

It is the purpose of this article to point out briefly certain features of the foot-rot disease which have been observed in the course of the writer's investigational work and, in passing, to mention some of the diagnostic features of both take-all and fusarium root-rot.

Distribution and Host Plants.

Foot-rot on wheat has been recorded from each of the principal wheat-growing districts of the State; the disease was first recorded in 1913 on wheat from Bathurst, but the importance of *Helminthosporium* in reducing yields was not realised until 1921, when the disease assumed serious proportions.

Foot-rot is known to occur on numerous plants, and in this State has been recorded on wheat, oats, barley, rye, awnless brome grass, barley grass, brome oat grass, canary grass, corkscrew grass, couch grass, rat's tail grass, red fescue, and sterile brome grass. Amongst the cereals no variety has been found completely resistant to the disease, although in seasons favourable to the development of foot-rot it has been observed that long-season wheats are sometimes more severely attacked than are the short-season varieties; oats are usually very resistant to the disease.

The Economic Importance of Foot-rot.

Foot-rot is one of the most serious wheat diseases in this State, and may cause loss as the result of (1) seedling blight occasioned by attack of the fungus during very early growth, leading to reduction in stand, and (2) impoverished grain yield of individual plants. Its occurrence has been

* Including *Brachysporium* sp., *Colletotrichum* sp., *Gibberella saubinetii*, *Helminthosporium* sp., *Leptosphaeria* sp., *Macrosporium* sp., *Phoma* sp., *Rhizoctonia* sp., *Rhizopus* sp., *Sarcinella* sp., *Verticillium* sp., *Wojnowicia graminis*, and several undetermined fungi.

noted particularly in the North-western, Central-western, and South-western Slope areas. In the 1921 season severe losses were sustained on the Central Tableland—some crops failed completely. In 1926, foot-rot and take-all were observed to be the most prevalent diseases in the Central-west, and in the Parkes district were responsible in some instances for damage amounting to from 30 to 50 per cent. Cases of 60 per cent. infection were noted in 1928 in the North-west Slopes. In 1929 the disease reached epidemic form in sections of the central-west, whilst in 1930 several crops in this area were seriously reduced in yield, as also were a number of stands in the north-west and Riverina. In the season just passed foot-rot and take-all have been again much in evidence; cases of very heavy infection with foot-rot have been noted in wheat and barley—rye and oats being very lightly attacked. In the Narromine district the yield of one wheat crop was reduced by over 25 per cent. Instances of 75 per cent. infection and over have been noted in wheat experiment plots at Bathurst, Cowra, and Wagga.

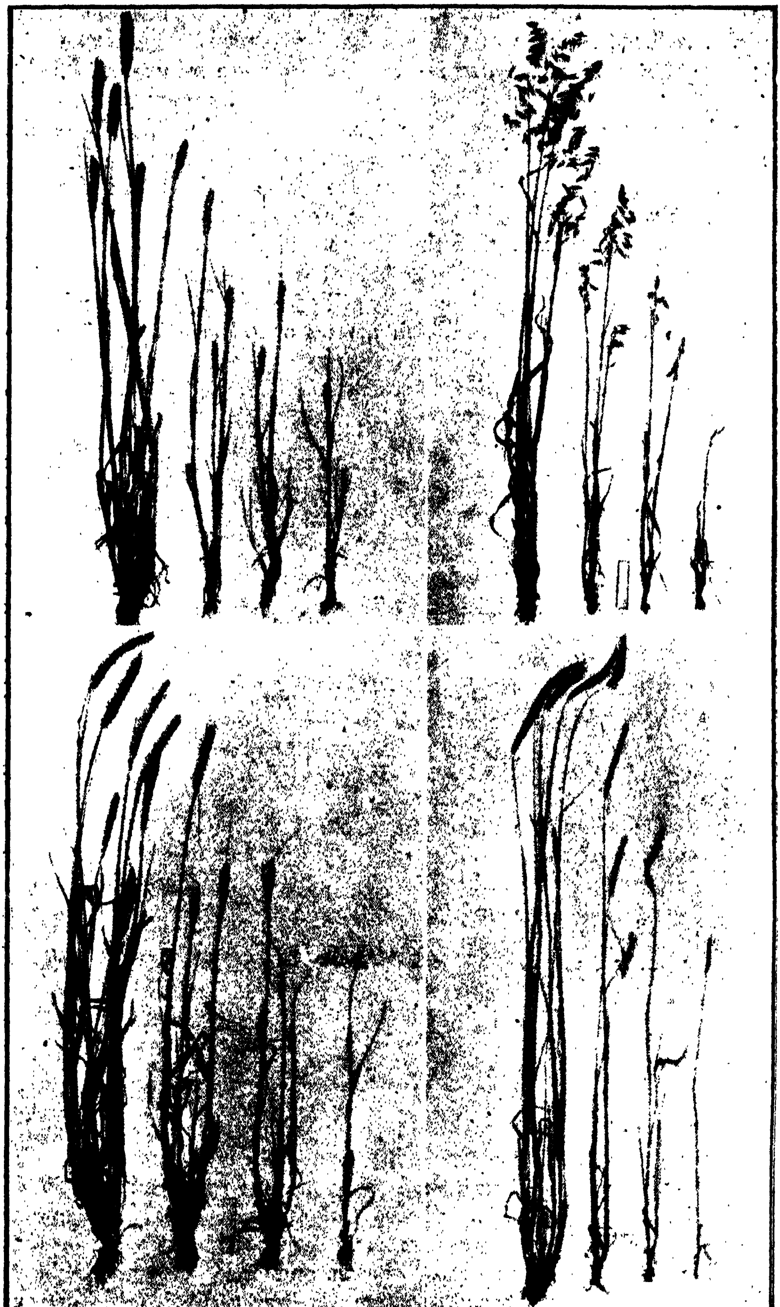
In the Cowra district in 1929, oats, both in experiment and commercial crop areas, were observed to be badly attacked by foot-rot. Early-sown varieties were most severely damaged, and the extent of infection amounted to 25 per cent. of the total plants; the fungus *Helminthosporium sativum* was isolated from affected specimens.

Symptoms.

The symptoms of the *Helminthosporium* disease are, in general, similar on all four cereals. The following account is a rather detailed description of foot-rot on wheat.

The disease may appear at any time in the life of the plant; the causal parasite can attack all parts of the susceptible host from roots to head and grain, but in this State the foot-rot condition on seedlings and older plants is the most constant feature of the disease. Under conditions favourable to the development of the parasite the percentage germination of wheat is often reduced considerably. Some seeds commence to sprout but are soon killed through invasion of the fungus; again young seedlings may, though stunted, make considerable growth and then become yellowish and die from the attack of the parasite which has penetrated the roots and base of the stem, producing tobacco-coloured markings; some plants infected early may recover and make quite good growth. Many cases of poor stands in wheat are attributable to these seedling-blight conditions caused by the foot-rot fungus.

Usually, however, the disease does not assume a conspicuous form until the plants are in head. Foot-rot is generally most noticeable in an affected area from the ear-peeping stage until the mid-dough stage, and the most striking symptom is the premature ripening of the ears, some ears failing to develop beyond the ear-peeping stage; early heading, flowering, and ripening are symptoms frequently observed. The disease usually appears on plants scattered throughout the crop, but may also appear in patches.



Foot-rot in Cereal Plants

Left Upper, Wheat; *Right Upper,* Oats; *Left Lower,* Barley; *Right lower,* Rye.

On the left **of each group is a healthy plant, while the three plants to the right show infection of various degrees of severity.**

Other above-ground features of mature, affected individuals are reduction in height, reduced number of tillers, slightly bleached appearance of ears (which are often undersized), and partial or complete failure of some heads to produce grain—if grain is developed it is usually very pinched. Frequently foot-rot does not appear until very late in the life of the plants, when the principal aerial effects are premature ripening and slight pinching of grain. Sometimes the main tillers are quite healthy and the disease is evident only on the lower head-stalks; excessive small-shoot production sometimes occurs, and many of the shoots which attain a length of 3 to 8 inches are often killed, and completely rotted at the base. Buds developed at the base of the stem are frequently killed early and appear brown to black in colour, and are covered with masses of *Helminthosporium* spores. Foot-rot affected plants have been observed to exhibit a darker green colour than normal plants; this feature has been noted in wheat, oats, barley, and rye.

Examination of the butts of affected plants shows a pronounced rotting of the roots, ashen-grey discolouration of outer basal sheaths, and brown or tobacco-coloured areas at the base of inner sheaths and on the lowest joints and interjoints of the straw. The crown is sometimes completely rotted, badly infected plants being readily pulled up owing to the rotten state of the root-system. The markings at the base of the straw may appear as spots, streaks, or as a uniform discolouration, and may extend as far as the third interjoint. Often a soot-like dust is found between the sheaths or between the innermost sheath and the straw, and this dust consists of spores and filaments of the foot-rot fungus.

It is important to note that plants attacked by foot-rot do not necessarily exhibit brownish discolourations at the base, although these markings are usually present; often the attack is confined to the root-system and the diseased condition of the roots is sometimes the only diagnostic feature of the disease in respect of the basal region of the plants. Additional roots are frequently developed from joints above the first node in affected plants, and these in turn often become rotted, either at the tip or at the point of emergence from the joint.

Mature plants affected with take-all exhibit many of the symptoms described for foot-rot, and whilst it is not always easy to distinguish the two diseases in the field the following features are considered diagnostic of take-all. The disease is characterised by the occurrence throughout the crop of patches of stunted plants with reduced number of tillers and poor root-system; heads markedly bleached, prematurely ripe, and usually devoid of grain, although some very pinched grain may be produced; greyish-black discolouration of outer sheaths at base of plants; occasional development of black dot-like bodies (spore cases) on basal sheaths; incrustation or plate of fungus threads between innermost sheath and base of straw, this plate, which readily flakes off, varying from dark-grey to blackish-brown in colour, and being either dull or shiny in appearance; light to dark-brown

discolouration of base of straw—this may appear in the form of spots, streaks, or uniform marking.

The occurrence of fusarium root-rot on cereals in this State was first noted in 1912 on wheat, whilst root-rot due to the fungus *Gibberella saubinetii* was first observed in 1922 on oats. Fusarium root-rot has also been found on oats, barley, and rye in different districts; the symptoms produced are somewhat similar to many of those described for foot-rot, but the disease can usually be identified by the pinkish discolourations of roots, basal sheaths, and straw.

A condition in wheat termed "haying-off" and characterised by sudden premature ripening of ears in well-developed crops has frequently been observed in wheat in some seasons. Whilst this condition has been attributed to a deficiency of soil moisture at a critical period in the life of the plant, it is suggested that the trouble may be due to a very late development of foot-rot on the plants' roots, occasioned by a peculiar set of environmental conditions.

The Causal Organism.

The fungus responsible for foot-rot is not only able to attack living plants but can also live on dead or decaying organic matter; thus it survives on remains of old roots and straw left in the soil after the crop is removed. Experience in this State shows that the disease is not normally carried over in the seed; grain from affected crops will produce clean plants.

The spores of the fungus are able to live for long periods under certain conditions; in the laboratory preliminary tests have shown that the fungus is able to live over in infected stubble for at least twenty-one months, and that under dry atmospheric conditions the spores retain their viability for at least twenty months; spores kept in dry soil under laboratory conditions proved viable after thirty-five months.

A striking feature of the foot-rot organism is that it consists of numerous strains or physiologic forms, each of which possesses definite characteristics in respect of spore dimensions, growth features, and pathogenic virulence on cereals and grasses. Numerous isolations of the foot-rot fungus have been made from various cereal and grass hosts in this State, and the existence of several distinct physiologic forms has been established from both laboratory and glass-house investigations; this phenomenon, insofar as virulence is concerned, is illustrated in the results of an experiment set out in Table I. For this test 6-inch pots of soil were sterilised and heavily inoculated with cultures from distinct single-spore isolations of the fungus propagated on sterilised mixtures of wheat and oats in flasks. Twenty-five grains of Hard Federation wheat or Algerian oats were sown to a depth of 1½ inches in each pot. The experiment was conducted in quadruplicate in the glass-house during warm weather, and the results were recorded four weeks after planting. It will be observed that striking differences in virulence were exhibited by the various isolations used.

TABLE I.—Effect of Various Isolations of *Helminthosporium sativum* on the Germination of Wheat and Oats.

Isolation from—	Host Inoculated.	No. of Seedlings in Each Pot.* A.	B.	C.	D.	Total Number of Seedlings.	Average Height.	Reduction in Germination (per cent.)†
Wheat ...	Wheat	1	2	3	4	10	4 inches (few 7 inches) ...	87
	Oats ...	11	14	15	15	55	8 inches (few stunted) ...	36
Rye ...	Wheat	0	0	0	0	0	....	100
	Oats ...	1	0	0	0	1	6 inches	99
Barley grass	Wheat	3	5	6	6	20	7 to 8 inches	73
	Oats ...	5	8	9	12	34	8 inches	61
Barley ...	Wheat	4	5	8	9	26	Irregular; up to 8 inches...	65
	Oats ...	17	20	24	25	86	9 inches	0
Control ...	Wheat	17	17	17	24	75	9 inches	...
	Oats ...	19	20	22	25	86	9 inches	...

* Twenty-five grains planted in each pot. † As compared with Control.

The fact that physiologic forms of foot-rot vary in their distribution and virulence is a probable explanation of the occurrence of an epidemic of the disease in one locality and not in another.

Factors Influencing Disease Development.

It is generally recognised by investigators of the cereal foot-rot problem that the development of the disease is not only dependent on the presence of virulent forms of the fungus, but also on the prevalence of certain environmental conditions—conditions which favour development of the parasite or which weaken the host and predispose it to infection. Experimental work has shown that plants may become infected at different stages of their development; severe seedling-blight may be followed by complete freedom from the disease in those plants which survive early attack, whilst under another set of conditions plants may not become infected until much later in the growing period.

In the writer's experience of the disease it has been observed that development of foot-rot is attributable almost entirely on the one hand to conditions which favour growth of the fungus, and on the other to conditions which have had a debilitating effect on the plants' metabolism. Some of these particular features are briefly discussed below under separate headings.

Cropping Systems.—Foot-rot is usually well-developed in wheat crops grown on land which previously has been under grass for some years; the theory is that the causal fungus lives over and multiplies on the roots of various grasses, and there is a good deal of evidence to support this idea, for one investigator has recorded the natural occurrence of foot-rot on thirty-two distinct species of grasses.

Where wheat follows wheat on the same land the disease may develop to a much more marked extent than in cases where crop rotation systems are introduced; this is due in part to an increase in the amount of fungus material in the soil and in part to a depletion of plant food material, thus

leading to lack of vigour in growth and predisposing the plants to parasitic invasion.

Feeding-off.—Field observations in the central-west in 1925 and 1926 showed that wheat crops which had made splendid growth and which were fed off in July subsequently incurred severe damage through take-all; sections of the crop in the same paddock which had not been fed off were quite free from the disease. The same phenomenon has been observed in the case of foot-rot. It is considered that feeding-off gives the plants a check which renders them particularly susceptible to the development of these diseases.

In order to obtain confirmation on this point, field tests were conducted at Cowra Experiment Farm with early-, midseason-, and late-maturing varieties of wheat in small plots. The plants in certain of the plots were cut back when at a height of about 9 inches to within ½ inch of the soil level, whilst other plots were left as controls. Typical foot-rot reaction of selected varieties only is given in Table II.

TABLE II.—Severity of Infection with Foot-rot in Different Varieties of Wheat, (*a*) Cut back, (*b*) Untreated.

Variety.	Severity of Infection.*					
	Untreated Plots.			Cut Back Plots.		
	A.	B.	C.	A.	B.	C.
Turvey	2	2	3	5	5	5
Carinda	1	1	1	5	5	5
Bald Early	2	2	3	3	3	5
Wandilla	2	1	3	3	3	5
Nabawa	3	3	3	5	5	5
Gresley	2	3	3	5	4	4

* 1, slight; 2, moderate; 3, fairly severe; 4, severe; 5, very severe.

The season proved to be favourable to the development of the disease in both treated and untreated plots, but the severity of foot-rot in the former is evident from the results indicated; the grades of severity recorded were based on the general reaction of the plants as evidenced by stuntedness, premature ripening, and production of pinched grain. Thus, in seasons favourable to the development of foot-rot, the practice of feeding-off may be expected to increase considerably the severity of the disease in wheat.

Frost Injury.—Frost, *per se*, is known to cause considerable damage to wheat in certain seasons. Considerable evidence has been accumulated in support of the contention that subsequent to frosting the damage from foot-rot is often very acute. Frosting of wheat stems sometimes extends as far as the basal interjoints, producing a brownish discolouration; these tissues become weakened and thus furnish a ready avenue of entrance for the foot-rot fungus. In the 1929 season a wheat stand of 700 acres in the Riverina was observed to be very badly attacked by foot-rot, following the

occurrence of frost; on a conservative estimate the loss sustained amounted to 75 per cent. of the potential yield; neighbouring crops which had not been frosted were free from the disease.

Temperature and Moisture.—It is known that high soil temperatures and high soil moistures favour the development of foot-rot; experience of the disease in this State has shown that these factors are often of considerable importance.

The effect of temperature on seedling-blight in wheat is evident from the results set out in Table III. This experiment was of a very comprehensive nature, but it is not possible to indicate all the results here. The test was conducted at Cowra Experiment Farm and consisted of a number of small plots of wheat, some inoculated with foot-rot spores prior to sowing and others untreated. Ninety seeds were planted in each plot and sowings were made on different dates. Whilst different varieties were used at each of the plantings it is significant that varieties sown early in inoculated soil showed marked reduction in stand as compared with those sown late in similar soil. The condition of the soil at each planting was distinctly moist, and it is considered that the differences shown are attributable to the effect of soil temperature which generally is higher at the early sowing period than later.

TABLE III.—Percentage Germination in Control and Foot-rot Inoculated Plots in Selected Late- and Early-maturing Varieties of Wheat.

Variety.	Date Sown.	Percentage Germination in each Plot.							
		Control.			Average of Control Plots.	Inoculated.			Average of Inoculated Plots.
		A.	B.	C.		A.	B.	C.	
*Cadia	27 April ...	85	84	82	84	61	56	48	55
*Currawa	27 " ...	84	84	78	82	57	51	50	53
*Marshall's No. 3 ...	27 " ...	92	84	82	86	50	50	48	49
†Aussie	29 May ...	97	91	91	93	72	70	69	70
†Bobin	29 " ...	85	85	72	81	66	66	62	65
†Clarendon	29 " ...	89	86	81	85	69	64	61	65

* Late Maturing. † Early Maturing.

Thus early planting may, in some seasons, be responsible for severe reduction in stands of wheat sown in infested soil. Late-sown wheats stand a better chance of escaping the seedling-blight effects, and there is also some evidence, incomplete as yet, to support the idea that early-maturing varieties are not as severely attacked by foot-rot in the later stages of growth as are the long season wheats.

Varieties sown later than their maturity-classes demand might be expected to show less seedling-blight than if sown at the time recommended or earlier; in experiment plots, Canberra wheat sown on 29th May showed 12 per cent. reduction in stand through seedling-blight as against 2 per cent. when sown on 18th June; similarly, Yandilla King wheat sown on

30th April, showed 24 per cent. seedling-blight as compared with 16 per cent. when sown on 19th May.

Data in respect of the effect of soil moisture on the disease is not yet complete. A study of the relationship of rainfall to the incidence of foot-rot is still in progress, and all that can be stated now is that the disease has been observed to assume epidemic form in both very wet and very dry seasons. It is of interest to note that preliminary controlled experiments in the glasshouse have shown that the severity of seedling-blight of wheat in soils maintained at 30 per cent. and 65 per cent. of the water-holding capacity was the same throughout.

Fertilisers; Fungicidal Dusts.—For some years past field and glasshouse experiments have been conducted to ascertain whether the application of superphosphate to the soil or of certain mercury dust fungicides to the seed would limit the development of foot-rot in wheat. Space does not allow of the incorporation of the results in this article, but the results show that the amount of seedling-blight, at least, is markedly reduced by increased applications of superphosphate or by applying certain dust fungicides to the grain prior to sowing. Further work is in progress.

Control Measures.

Since *Helminthosporium sativum* can attack many cereals and grasses, and can also live over on dead plant remains in the soil, it is obviously a difficult matter to bring the disease completely under control. No varieties of wheat are known to be immune to the disease, but grades of susceptibility have been observed in numerous wheats under field conditions in a foot-rot year; some varieties appearing extremely susceptible, others fairly resistant. Further work is necessary to ascertain whether there really are any resistant or moderately resistant wheats amongst the varieties under test in this State.

In spite of the complexity of the foot-rot problem the following measures may be expected to minimise losses from the disease:—

1. Burn stubble of affected crops; this destroys a good deal of the fungus material at the base of the plants.
2. Bare-fallow infested land and keep down grasses; this helps to starve the fungus in the soil.
3. Avoid continuous cropping of land to wheat and introduce a resistant crop into the rotation system; oats usually are very resistant to foot-rot.
4. New land prepared for cropping should, where practicable, be sown with oats as the first crop; both foot-rot and take-all are often serious in wheat grown as the first crop on land which has been under grass for several years.
5. Adopt the standard methods for preparation of the seed-bed and use the varieties recommended for different districts; apply superphosphate.
6. Always use sound, plump grain for seed purposes; grain showing discolouration at the tip should be rejected. "Black point" at the embryo end of the grain is sometimes caused by the foot-rot fungus.
7. As far as possible, avoid feeding-off all wheat crops grown for grain.

Varieties of Oats in New South Wales.

[Continued from page 17.]

ALLAN R. CALLAGHAN, D.Phil., B.Sc. (Oxon.), B.Sc.Agr., Assistant Plant Breeder.

IN the previous issue a brief review of the morphological basis for the description of oat varieties was given. It is proposed now, to deal with the varieties separately, and incorporate in each description the most important agronomic and morphological characters. The varieties will be described in the order of their importance, or as near as this can be judged.

Algerian.

Originally introduced from Algeria, Northern Africa, this variety quickly established itself as the most useful of all varieties under Australian conditions. In comparison with other varieties introduced about the same

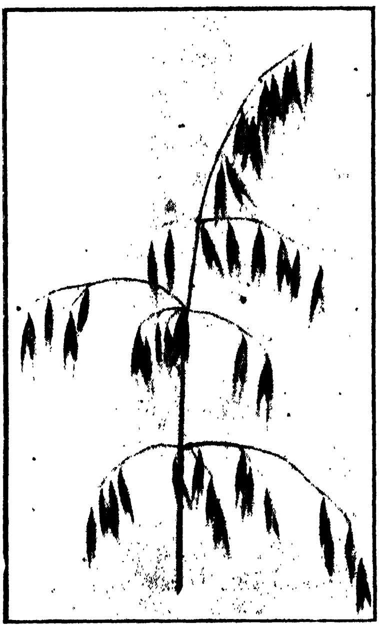


Fig. 9.—Panicle of Algerian.

Note the rachis leaning slightly to one side at the tip, and the drooping branches.

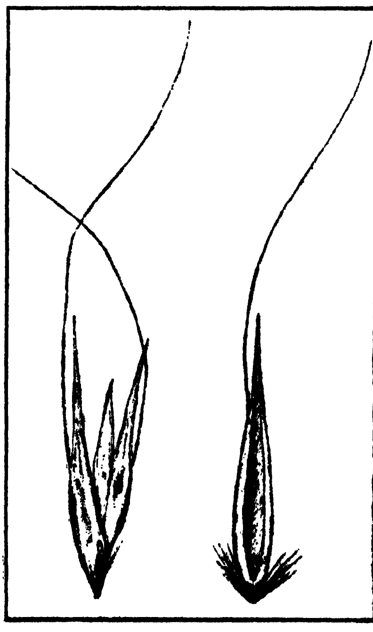


Fig. 10.—Spikelet and Grain of Algerian.

The weak awns on the first and second grain of the spikelet, the well-defined basal scar and abundant basal hairs are typical characters of the variety.

time it was unusual, in that it combined good tillering ability and general prolificacy with drought resistance and suitable maturity. The variety under this name at present grown and recommended by the Department, is an improved line of the original type, and was actually evolved from a

cross, made at Wagga Experiment Farm, between Algerian and Red Rustproof. The Red Rustproof parent is closely related to Algerian and morphologically very similar. The progeny from the cross showed very little variation, and the new strain evolved therefrom could not be distinguished from the old Algerian except in performance; for this reason the old name was retained. This evidence explains to a large extent why growers of Algerian remark on differences between crops grown from seed of different origins. The Departmental strain is recognised as superior to all others under New South Wales conditions.

It was unfortunate that the same name was retained for the improved strain, even though it was botanically identical with the original Algerian. Whilst it is quite impracticable to name the strain now, it is proposed to multiply the seed of the Departmental Algerian in future under the number W. 1093, and growers will be well advised to confine their attention to this particular strain.

In early growth Algerian is prostrate, and this feature, together with its very narrow leaves and high tillering co-efficient (4 to 4½), gives it a somewhat grass-like appearance. At no stage in its growth is Algerian very flaggy, and, except for a few hairs along the margins of the lowermost leaves, the foliage is glabrous. The leaf-sheaths develop a decided purple tinge just prior to ripening; this is most pronounced on the sheaths surrounding the middle of the culm.

The straw is medium-strong to strong and can usually be depended upon to stand very well. It is medium-tall, slender and of good quality, with no colour immediately below the panicle, but very purple in the vicinity of the nodes, especially just below.

The panicle is of medium size, and of the open pyramidal type; the rachis inclines slightly to one side at the tip; the branches are long and leave the rachis at right angles and droop over. The spikelets, though distributed throughout the panicle, are usually concentrated towards the end of the branches; they are large and hang over in pectinate fashion (see Fig. 9).

The grain is brown, rather long and pointed, of only medium quality. A prominent feature of the variety is the nature of its awns, the first and second grains of each spikelet invariably bearing a weak awn. A definite basal scar of the semi-articulating (intermediate) class is well defined on the primary grain of the spikelet; it is accompanied by numerous long brown hairs which are arranged in two tufts on either side. The rachilla is never left on the primary grain after threshing; it fractures at the base and is retained on the second grain. The general grain characters are illustrated in Fig. 10.

Threshed grain samples of Palestine, Belar and Algerian are very similar. Studied direct from the panicle, however, Palestine possesses, as a general rule, three grains per spikelet, and the grain itself has a few long hairs

on the flowering glume or lemma, especially near the base of the awn; Belar is readily distinguished by its strong awn on the first grain only, and the absence of basal hairs.

Although classed as early to mid-season in other countries, Algerian marks the standard of late maturity in New South Wales. Undoubtedly its greatest attribute is drought resistance, for it can be cultivated where no oat of the English type would survive. Its agronomic acceptance has not only contributed much to the benefit of the farmer, but has formed a basis for the plant breeder as well, many of our principle varieties possessing Algerian factors in their constitutions. The breeding objective has been to reduce the tillering capacity of Algerian, but increase the yield per panicle, thereby producing a more thrifty type for dry conditions. This has been accomplished to a large extent in the varieties Guyra and Gidgee.

On account of their earlier maturity, varieties such as Belar, Mulga, Gidgee, &c., have increased in favour at the expense of Algerian, especially in the drier western districts, but Algerian is still a general favourite as a dual-purpose oat in the tableland districts and on the western slopes. It is particularly suited for grazing on account of its excellent powers of recovery, but should be sown in early autumn on account of its comparatively slower early growth during cold weather. Its one drawback as a grazing oat is that it is somewhat unpalatable or bitter to stock during its young growth.

Algerian is very susceptible to loose smut, and although susceptible to stem rust, it has a field resistance to crown rust.

Several varieties conform closely in morphological characters to those of Algerian, described above. Most of these can be distinguished on the basis of early-growth habit, maturity, and minor characters. Algerian, however, is sometimes sold under the names of Mortgage Lifter and Million Dollar—fanciful names artfully employed by seedsmen.

Belar.

Belar was selected from the variety Sunrise at Glen Innes in 1918, and probably owes its origin to a natural cross between that variety and Algerian. It resembles Algerian in colour and shape of grain, and Sunrise in that it bears a strong awn on the primary grain only. It is characterised by stronger, though much finer, straw than Sunrise, and consequently is much better adapted for hay.

The early growth of Belar is not as prostrate as Algerian, nor does it tiller so profusely; it is classed as semi-erect with a tillering capacity of 3 to 3½ (scale 5). The plants grow compactly with medium-wide foliage, bearing no hairs on the leaf-margins except for a few on the first leaves. The leaf-sheaths turn to a very deep purple as the plants mature; the colour is less marked and may be absent from the sheath of the last leaf, and it increases in intensity towards the base of the plant; this is in contrast with Algerian where the colour is most intense around the middle of the plant.

The tall straw of Belar is of excellent quality, combining strength with fineness to a marked degree. The nodes are prominent, with a few hairs on the stem immediately above and below as a general rule. Like Algerian its straw has a distinct purple colouration which is deepest just below the nodes.

The panicle of Belar (see Fig. 11) strongly resembles that of Algerian in that it is of medium-size, pyramidal, with the rachis-tip leaning slightly to one side; the drooping branches are also arranged at right angles with the rachis. Except for a decided tendency to crowd towards the end of the longer branches the large spikelets are fairly evenly distributed.

Belar has shiny brown grain, which although fusiform in shape is fairly plump. The basal scar of the primary grain is definite, though less pronounced than that of Algerian; basal hairs are entirely absent. The rachilla fractures at the base and is thus retained on the secondary grain. A strong awn borne on the primary grain of all spikelets, but absent from the secondary grain, makes it possible to distinguish Belar from Algerian at a glance. The differences can be seen by comparing Fig. 12 with Fig. 10.

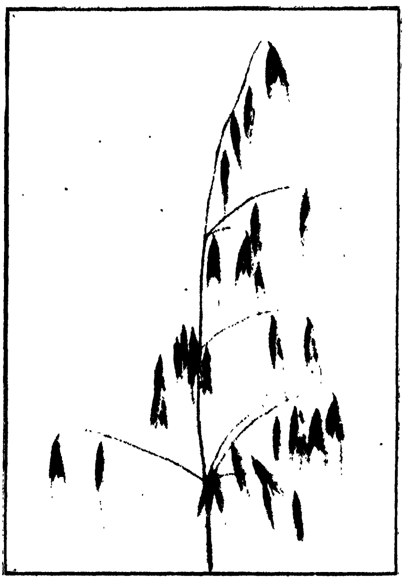


Fig. 11.—Panicle of Belar.
The panicle is of the general pyramidal class, with the rachis inclined to one side at the tip.

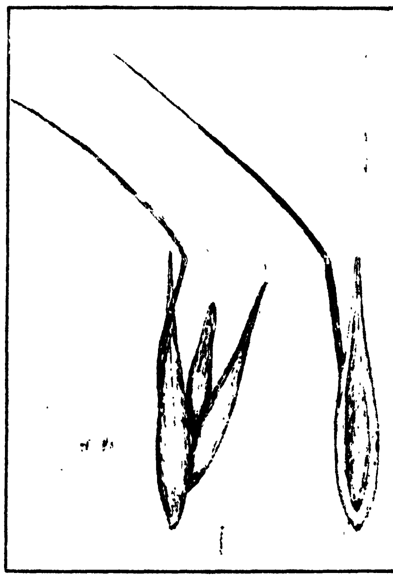


Fig. 12.—Spikelet and Grain of Belar.
Note the strong awn on the primary grain only, and the absence of basal hairs.

Belar is classed as an early midseason variety, and it is doubtful whether varieties of earlier maturity are desirable for the more favoured wheat districts where oats are grown. Consequently, in these districts Belar is now accepted as the standard early-maturing variety in preference to the old standard, Mulga. It yields consistently well, both for grain and hay, and is rapidly replacing Mulga, especially on the Central and South-western Slopes

and in Riverina. Compared with the latter variety it is a better dual-purpose type, it has finer, stronger, and generally more attractive straw characters, and is much less liable to shatter in the field: as a grazing oat it gives more satisfactory results, especially if sown early, as it recovers better and does not run into panicle so abruptly when warm weather sets in. The ease with which Belar threshes makes it a distinct improvement on Lachlan as a grain variety.

Belar is susceptible to loose smut, stem rust and crown rust of oats.

Fig. 13.—Panicle of Mulga.

In the panicle of Mulga the rachis is erect; the branches are medium-long and their angles of exsertion vary from 60° to 90°.

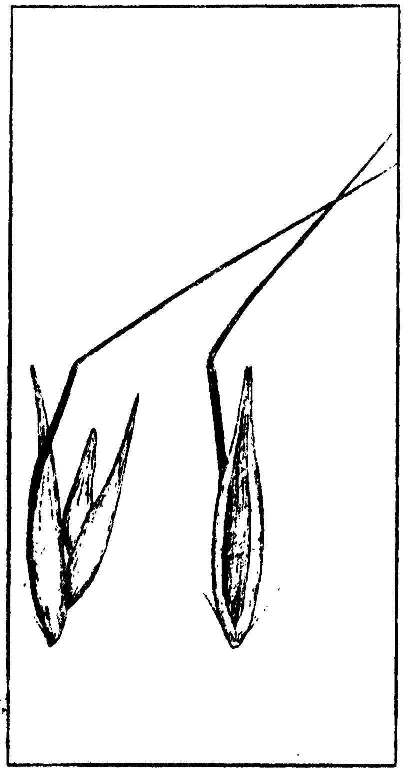


Fig. 14.—Spikelet and Grain of Mulga.

Note the strong awn on the primary grain only, and the sparse basal hair development. The apex of the rachilla to be observed in the frontal view of the primary grain is definitely split or frayed through fracture; occasionally basal fracture takes place.

Mulga.

Mulga was selected by Mr. J. T. Pridham at Cowra in 1917 from the very variable variety Sunrise, and like its progenitor, it, too, is noted for its instability. The variation in grain colour, extent of basal hair development, and other minor characters in different strains which have been collected and grown for comparison, supply abundant evidence that the original line was distributed before it was fixed for all characters.

Some of these strains, unfortunately, are inferior in general prolificacy to the original line, and their presence has prejudiced the favour of this variety in recent years, their low yields having undoubtedly caused the inconsistency of field results.

The description given herein is that of the standard type, which has creamy white to very light-brown grain.

The young growth is erect, bearing medium-broad, dark-green foliage, with hair-fringed margins; it has a medium-low tillering index, assessed at 2 to 2½. The foliage is somewhat stiff and erect in comparison with varieties such as Sunrise. The leaf-sheaths usually develop a deep-purple colouration.

The tall straw of Mulga is medium-coarse to coarse and medium-strong. Lodging in Mulga is usually the result of excessive growth due to various causes, such as, too early sowing and abnormally high rainfall during the growing period; sown in season, it can usually be relied upon to stand sufficiently well for stripping. The straw is purple except just below the panicle; the nodes are glabrous.

The panicle is medium-large, of the open equilateral type and is classed as pyramidal. It is illustrated in Fig. 13. The branches are medium-long and their angles of exsertion vary from 60 to 90 degrees. This character is most noticeable in the main branch from each node which usually makes an angle of 60 degrees with the rachis. The rachis-tip of the panicle is erect: the spikelets are medium-large and distributed evenly, but are not as numerous as in the panicle of Sunrise: this latter feature gives the Mulga panicle a more sparse appearance in comparison with that of Sunrise.

The grain of Mulga is plump, of average quality, and creamy white to very light brown. A small basal scar is evident on the primary grain. Only a very few basal hairs are present; these are long and very fragile, and easily dislodged in handling. By way of contrast, Buddah has no basal hairs. The rachilla is of medium-length and is normally retained on the lower grain, but its apex is definitely split or frayed through fracture; occasionally it is retained on the second grain of the spikelet as a result of basal fracture. A strong awn is borne on the first grain only of all spikelets. For the details of the grain characters see Fig. 14.

For late sowings in any district Mulga can be relied upon for grain production; in this regard it has an excellent record for the drier, short-seasoned areas of the State; it should, however, be taken off as soon as mature, as it is liable to shed its grain seriously.

As a grazing oat this variety has the reputation of producing an abundance of early green feed, which is very palatable to stock, but it lacks length of season and has exceptionally poor recovery power. The popularity that Mulga has enjoyed has been prompted by its early maturity and rapidity of early growth, but there is some evidence that a slightly later maturing variety will serve the main wheat-growing areas to greater advantage. Preliminary experiments on the grain-production of varieties carried

out in these districts with Mulga as the standard have indicated that varieties such as Belar will prove superior. Similarly, grazing tests have proved that types such as Belar and even Algerian, sown early enough, will produce little inferior bulk of early feed and will recover much better after successive grazings. It is only with late autumn sowing that Mulga shows its marked superiority in the first early growth.

Mulga has some resistance to loose smut, but is susceptible to stem rust. It is also susceptible to crown rust, and for this reason, has not the popularity of either Buddah or Sunrise in coastal areas.

(*To be continued.*)

Lower North Coast Winter Fodder Contest, 1931.

Last season was the fifth consecutive year that branches of the Agricultural Bureau of New South Wales in the districts from Dungog to the Macleay River have conducted a winter fodder crop competition. The weather conditions were unfavourable, rain falling almost continuously during the late summer and autumn, preventing the competitors from getting the summer crops off and the land prepared for the winter fodders. After June dry conditions prevailed to the end of the growing period, and were accompanied by much wind and late frosts.

For these reasons entries were fewer than usual, and only five branches competed in the championship, viz., Temagog, Austral Eden, Bandon Grove, Fosterton, and Kendall (the lastmentioned—a new aspirant—also conducting a local competition), though three other branches, viz., Hannam Vale, Taree Estate, and Dumaresque Island, which were not eligible for the championship, were also represented by one entry each.

First place in the championship was awarded to Mr. E. E. Booth, of Austral Eden, for a crop of Sunrise oats, Canberra wheat and field peas, than which, in the opinion of Mr. J. M. Pitt, Senior Agricultural Instructor, who judged the competition, nothing better for quality and succulence was seen on the coast. Following a crop of maize cut for fodder, the plot, a heavy loam, was ploughed in January and 2 cwt. lime and 3 cwt. superphosphate per acre applied. Because of the wet conditions no further workings were given until early May, when the plot was again ploughed. Sowing took place on 22nd May, and excellent and dense growth, the result of the fallowing and heavy fertilising, followed.

Second place was also awarded to Mr. Booth for another entry (Mulga oats, Canberra wheat, and field peas), and third place went to Mr. G. Germon, of Fosterton, for a plot of Sunrise oats, Gresley wheat, and field peas.

A full report of the contest appeared in the January issue of the *Bureau Record.*

One of the best methods of treating land badly infested with black oats is to sow an early-maturing variety of oats as a fodder crop, to be grazed by sheep and then ploughed down before the crop can ripen its grain, or, in a prolific year when the fodder crop may not be required, to be converted into silage while still green.

Wheat Crop Growing Competitions, 1931.

REPORTS FROM VARIOUS DISTRICTS.

Dubbo and Adjacent Districts.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

THE crop-growing season just experienced has been an abnormal one—unfortunate for some farmers on the lighter types of soils and for those late with their farming operations, but extremely favourable and profitable for those who were in a position to sow early, or whose soils were of a medium to heavy nature.

Five agricultural associations again conducted crop competitions, namely, Cumnock (9 entries), Dubbo (14), Gilgandra (24), Narromine (10), Wellington (28); total, eighty-five entries. Entries at Cumnock, Dubbo, and Narromine were restricted to crops grown on fallowed land only. Three crops were withdrawn at Cumnock prior to judging owing to hail damage, while two at Narromine did not comply with conditions and consequently had to withdraw.

The Season.

A record area was put under crop in 1930, but after a favourable seasonal start the effort ended in disaster for all concerned, partly due to a severe attack of stem rust which swept through all crops in the major portion of this district, but mainly on account of the unprecedented and unforeseen fall in parity prices to a figure far below production costs. This state of affairs caused many farmers temporarily to lose faith in their industry and to delay the commencement of the preparations for the 1931 crop—with unfortunate results for some of them.

Owing to the large area under crop in 1930 and to a dry September the area under fallow was much below normal. Furthermore, wet conditions during November and December, 1930, delayed harvesting operations and allowed fallowed areas to become overgrown with weeds. Those who burnt the heavy stubble growth and those with crops which were not stripped due to rust attack were able to obtain excellent clean burns during January or February and work the soil up cheaply with combines or scarifiers after useful rains, but many who delayed their stubble burnings until March were caught by heavy and continuous rains during that month, which caused a green growth through the stubbles, making it almost impossible to burn off or work up with any class of implement.

April was a good month for sowing, and many who started early were able to make good progress and sow under ideal conditions, with the result

that a comparatively large area was sown and germination was excellent. Heavy and almost continuous rains during the last three weeks of May and in June and early July caused an almost complete cessation of sowing on all types of soils throughout the district, and any sowing done during that period was attended with unsatisfactory results. After the rains ceased a further fairly large area was sown, but in spite of adequate soil moisture reserves these late-sown areas never had much of a chance owing to the advent of an extremely dry spring. August, September, and October were almost rainless, and no fall greater than about 50 points was recorded anywhere. Severe hail did a great amount of damage over a large area at Gilgandra early in September.

In spite of this long dry spell, early-sown crops grew well on the apparently adequate moisture content of the soils, and many fine and heavy-yielding crops matured in all districts, especially on the heavier types of soils. Crops on light, sandy soils did no good this year, and most crops showed some signs of waterlogging due to the excessive winter rains. It is probable that normal rains in the spring would again have developed a serious rust attack, so the dry spring was providential. The November rains were of benefit to late-sown areas without unduly affecting early-sown ripe crops.

The rainfall for the fallowing and growing periods at the various centres was as follows:—

RAINFALL Table.

	Dubbo.	Cumnock.	Gilgandra.	Narromine.	Wellington.
	Points.	Points.	Points.	Points.	Points.
Fallowing period (July, 1930, to March, 1931)	2,100	2,388	2,079	2,196	2,497
Growing period—1931.					
April	444	364	409	330	302
May	478	619	516	508	570
June	404	557	325	342	500
July	168	283	152	295	204
August	29	67	34	10	65
September	87	163	46	60	100
October	48	63	24	37	64
Total	1,658	2,116	1,506	1,582	1,805
Grand Total ...	3,758	4,504	3,585	3,778	4,302

Cultural Details.

Of the fifty-four crops sown on long fallow, the initial workings of which ranged from March to October, the majority were first worked during July, August, and September. The original ploughing was evenly distributed between mouldboard and disc types of ploughs, as shown by the

following table, but it is rather illuminating to notice the preference for disc implements in the more western portions of the district, while mouldboard ploughs predominated largely at Cumnock and Wellington. Seven competitors used rigid-tine scarifiers or combines for the first working.

Sixty-nine crops were sown with combines and six with seed drills, showing how popular the combine has become as a means of sowing. Two crops were sown by means of a hand broadcaster, owing to a heavy growth of thistles on strong, new basaltic soil.

District.	Average No. of times fallows were worked.	Initial ploughing done with—		Crops sown with—		Crops sown on—		
		Mouldboard.	Disc.	Combine.	Drill.	Fallow.	Stubble.	Lay land.
Cumnock ...	4·1	5	1	6	...	6	...	...
Dubbo	3·8	1	8	12	...	12	...	...
Gilgandra ...	4·3	6	17	21	1	12	11	3
Narromine ...	2·9	2	6	7	1	8	...	...
Wellington ...	3·5	20	3	23	4	16	3	8
Totals ...	...	34	35	69	6	54	14	11

Time and Rate of Seeding.

Only those crops which were sown early in the year succeeded in making satisfactory growth. Fifty-eight of the competing crops were sown during April, compared with nineteen sown early in May. Anything sown later was spoiled by excessive rains, and made spindly growth on account of waterlogging. Early sowing has demonstrated time and again its advantages in this western district, and provided the varieties used are sown in correct order, all sowings should be completed during April and May, if possible. Earlier sowings than April are inadvisable on account of the possibility of frost damage to crops when flowering.

The average quantity of seed sown has remained much about the same as in past years, with a slight falling off at Dubbo and Gilgandra. At Cumnock 57 lb. was the average, at Dubbo 52 lb., Gilgandra 50 lb., Narromine 55 lb., and Wellington 61 lb. The quantity used in the earlier-maturing districts to the west is necessarily less owing to smaller average rainfall and generally earlier sowing, which allows for better stooling habits.

Of the seventy-seven crops inspected thirteen competitors failed to treat their seed for bunt control, owing mainly to economic considerations of cost. The only traces of bunt seen were in two of these crops not treated. Of the balance, sixty-one, or 95 per cent., used the dry copper carbonate dusting process, which is absolutely effective, while three competitors used the old formalin treatment.

Varieties of Wheat Used.

The competing crops embraced sixteen different varieties, of which Nabawa was easily the most popular.

The following table shows the varieties entered and the number of placings gained by each:—

Variety.	No. of times entered.	Placings.			
		First.	Second.	Third.	Total.
Nabawa	38½	1	1½	2½	5
Waratah	10½	1½	...	1	2½
Riverina	2	...	1	1	2
Ford	1½	...	1	½	1½
Penny	4	1	...	...	1
Turvey	5	1	...	...	1
Purple Straw	1	...	1	...	1
Bobin	1½	...	½	...	½
Yandilla King	5½	½	...	...	½

Wandilla, Canberra, Gresley, Geeralying, Aussie, Currawa, and Federation were also entered, but did not gain places.

Nabawa again demonstrated its adaptability to a variety of seasonal conditions and to all classes of soils. It showed high resistance to diseases, and is likely to remain a highly popular variety.

Others well to the fore or worthy of mention were:—

Waratah, which, in spite of its liability to flag smut, is still a great bag-filler.

Ford (a South Australian variety), with one second and one third out of two entries deserves recognition and is likely to become popular as seed becomes available, owing to its resistance to flag smut and rust, as well as to definite strength of straw.

Bobin is a heavy-yielding early-maturing variety, but liable to rust.

Geeralying is a Western Australian, flag smut resisting, early-maturing variety that is likely to do well. It should also prove very useful as a palatable hay wheat.

Of the sixteen varieties exhibited, five were slow maturers, four mid-season, and seven fast growers.

Fertilisers.

The big fall in the farmer's income, due, firstly, to the abnormally low prices for his product, and, secondly, to the ravages of rust last season, combined with the uncertainty of the outlook, was largely responsible for the fact that the majority of the farmers were forced to do without superphosphate this year. Consequently only twenty-five of the competing crops received applications of fertiliser, fifty-two being sown without it. The

economic situation was further revealed in the fall of the average quantity used to 49 lb. per acre compared with 54 lb. in 1930.

Diseases.

Diseases of the wheat plant were not particularly prevalent this season, although some signs of most diseases were to be found in every locality, and in the aggregate disease probably caused a fair amount of loss.

Stem rust was to be seen in several crops, but conditions during the late spring were not suitable for its spread, and consequently it did not cause any material loss.

Flag smut was in evidence in susceptible varieties, but owing to the extensive sowings of Nabawa and other resistant varieties the losses from this disease were not as large as in past years.

Take-all and Foot-rot.—Damage from take-all and foot-rot was found to be more severe in the eastern parts of this district, notably around Cumnock and Wellington, although some stubble paddocks near Dubbo were found to be more affected by take-all than in any previous year. The wet winter was no doubt largely responsible for this.

Loose smut was noticeable in most crops, and particularly heavy infections were seen in two crops of Turvey, which seems rather liable to this disease.

Septoria leaf spot was responsible for killing off much of the lower flag in many crops, with probable detrimental effect on yields.

Frosts.

Damage by frosts at all stages of the plants' growth was found to have occurred at all centres. Occasional crops were caught early in the season, when the lower nodes and stems were affected. Others were caught when the ears were emerging from the shot-blade or sheath covering. Failure to pollinate, due to frosts at the flowering stage, was fairly common, but the most serious damage occurred as a result of late frosts affecting the ear after it had pollinated and set grain, apparently cutting off the sap supply. As a result the ears failed to fill, appeared slab-sided, greyish green in colour, and the grain shrivelled up to a negligible size. Not one crop that was inspected during the course of judging was found to be free from this condition, and in some crops fairly extensive losses were experienced.

Central-Western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

The total number of entries judged numbered 108, being distributed as follows:—Cowra P. and A. Association (14 entries in the "open" competition and 4 entries in the "under 640 acres" section), Cudal P. and A.

Association (12 entries), Canowindra P. and A. Association (10 entries), Grenfell P. and A. Association (22 entries), Molong P. and A. Association (4 entries), Eugowra Farmers and Settlers' Association (16 entries), Ooma Agricultural Bureau (9 entries) and Tyagong Agricultural Bureau (17 entries).

The Grenfell and Tyagong competitions were judged by Mr. T. P. Taylor, Experimentalist, Temora Experiment Farm, and the Cowra competitions by Mr. A. Pearson, Experimentalist, Cowra Experiment Farm.

The Season.

Rainfall conditions were satisfactory for early fallow preparation and spring workings. Harvest rains were heavy, extending into late December, and were responsible for much weed growth, making necessary the rather universal use of the disc cultivator in January. February rain was light, but in March it was generally heavy, causing considerable soil erosion and guttering in some localities These and early April rains made conditions for early sowing excellent, and fortunately a considerable area was sown that month. At the end of the first week in May rain commenced, and although not heavy in character was almost continuous for ten weeks, not sufficient time elapsing between each disturbance to allow the soil to dry. It became necessary either to sow in a puddled soil or very late, much being sown in August, resulting in poor germination and thin, uneven crops. The competition crops were without exception sown prior to the May rain. These crops made excellent growth throughout the season and were very dense, rather too tall for safety, but exceptionally well headed. Opportune rains in mid-November were responsible for the grain filling excellently, although causing a fair amount of lodging in the growthy crops. These rains were of particular benefit to the late-sown crops.

RAINFALL Table.

	Cudal	Molong	Canowindra	Grenfell	Cowra	Eugowra.
Fallowing Period— (August, 1930, to March, 1931)...	points. 1,640	points. 1,968	points. 1,718	points. 2,132	points. 1,811	points. 1,583
Growing Period— 1931.						
April	194	164	437	331	241	317
May	387	585	378	789	641	546
June	300	447	328	656	511	354
July	123	119	157	277	182	173
August	73	50	95	131	175	69
September ...	197	177	189	167	160	181
October	105	56	95	90	117	81
Total	1,379	1,598	1,679	2,441	2,027	1,721
Grand Total ...	3,019	3,566	3,397	4,573	3,838	3,304

The Winning Crops.

The details and award points of the winning entries in each competition are given in the following table:—

Association.	Name of Competitor.	Variety.	Award points.						
			Trueness to Type.	Freedom from Disease.	Evenness.	Condition.	Cleanliness.	Apparent Yield.	Total.
Cudal	H. J. Balcombe, Toogong, *via* Cudal.	Yandilla King and Turvey.	19	27½	19	9½	29	38	142
Grenfell and Tyagong.	H. Durham, Tyagong, *via* Grenfell.	Yandilla King ...	18	27	19	9	29	39	141
Cowra (640 acre competition).	J. Norrie, Morongla, *via* Cowra	Canimbla ...	19½	29	19	9	28½	34	139
Cowra	F. W. Harding, Billimari ...	Ford	19	29	18½	8	26	38	138½
Eugowra ...	M. W. Clemens, Forbes-road, Eugowra.	Waratah ...	19	28	19	9	29	33	137
Canowindra ...	S. E. Nash, Lockwood, *via* Canowindra.	Yandilla King ...	19½	27½	19	8½	27½	35	137
Ooma	J. J. Collingwood, Forbes-road, Grenfell.	Waratah ...	17	28	18	9	29	34	135
Molong	C. W. Reid and Son. Molong...	Waratah ...	19½	28	17½	8	26	33	132

The Varieties.

The accompanying table indicates the popularity of varieties and their success in the competition. It affords excellent evidence also of the behaviour of the varieties for the season—one which favoured the long-maturing varieties in particular—as shown by the excellent performance of Yandilla King. Turvey and Marshall's No. 3, of similar season, were also entered, the former showing to best advantage.

It is interesting to note that although Waratah was slightly the highest in the number of entries, its popularity has been challenged by Nabawa, but that this was not justified is plainly evident in its comparatively small percentage of wins—7.4 per cent. in Nabawa and 25.9 per cent. in Waratah. The continuous wet conditions during winter did not suit Nabawa, which stooled poorly and was very uneven, while Waratah was comparatively dense and never better headed than in this season.

Of the newer varieties Ford was outstanding and will play a prominent part in future competitions. Canimbla showed to advantage and is worthy of more extensive use as a competition or commercial crop.

TABLE Showing Behaviour of Varieties.

Varieties.	Total Entries.	Percentage of Entries.	No. of Times Placed.			*Percentage of Wins in Placed Crops.
			1st.	2nd.	3rd.	
Waratah	24½	22·5	3	1	3	25·9
Yandilla King ...	24	22·0	3½	4	1	36·1
Nabawa	21	19·2	...	½	3	7·5
Marshall's No. 3 ...	9	8·2	...	1	...	3·6
Turvey	6½	5·8	½	2	...	10·2
Ford	5½	5·0	1	½	...	7·5
Bobin	4	3·7	...	...	2	3·6
Canimbla	3½	3·0	1	...	...	5·6

* This is computed on the basis of 3 points for first place, 2 points for second, and 1 for third.

Wandilla, Bena, Purple Straw, Penny, Rajah, Hard Federation, Ranee and Baldwin, although entered, failed to gain places.

Trueness to Type and Purity.

The average points scored in each competition under this heading were:—Cowra 19.1, Ooma and Cudal 18.8, Eugowra and Canowindra 18.5, Molong 17.9, Tyagong 17.6 and Grenfell 17.4. The points for Grenfell district are below that of previous years, due to a large number of the competitors entering the competition for the first time. This is most noticeable in all such cases, and is evidence of the value of such competitions in promoting the use of pure seed. While it is extremely difficult to keep seed pure in the various processes of sowing, harvesting and grading, it can be kept reasonably so without much effort.

Grading and treatment with copper carbonate for bunt were general throughout the competition.

Rates of Seeding and Fertilising.

A falling off in the quantity of seed, and a considerable drop in the amount of superphosphate used were noticeable throughout the competition, as compared with the last two years. This was chiefly due to the necessity for economy. There was a considerable increase in the number of crops sown without manure.

The averages at each centre were as follows:—

TABLE Showing Rates of Seeding and Fertilising.

	Grenfell.	Tyagong.	Ooma.	Cowra.	Eugowra.	Canowindra.	Cudal.	Molong.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Seed per acre ...	56·0	59·0	56·7	60·0	60·0	63·7	65·0	58·0
Superphosphate per acre	52·0	47·2	40	54·0	49·2	45·7	52·0	56·0

Diseases.

Diseases did not exact a very heavy toll of this season's wheat crop. Although flag smut was bad in a few individual crops its attack was the lightest for some years. On the other hand, take-all was much more prevalent than in the past few seasons and foot-rot developed rather badly in some localities in the later stages of growth. Loose smut was more prevalent than last season, but except in isolated cases did not adversely affect the yield to any extent. The leaf spot fungus was again in evidence and affected the stooling of susceptible varieties. The average points awarded under this heading in the various competitions were as follows:—Grenfell 26.8, Tyagong 27, Eugowra 27.3, Ooma Bureau, 27.8, Canowindra 27.5, Cudal 28.4, Cowra 27.4, Molong 26.0.

Fallow Workings.

Fallow cultivations were slightly fewer than usual, due mainly to the desire on the part of growers to curtail expense by cutting out unnecessary workings and to the fact that the summer rains fell during harvest—the most inopportune time for cultivating. The springtooth cultivator (usually

the combine) was the implement most used, the rigid-tine being more popular in the Grenfell district. The disc cultivator was used to destroy weed growth on neglected fallows in January. The average workings amounted to one prior to January and two after that date, which does not include combine sowing, which was very general.

Yields.

The average yield of the 108 blocks judged was 31.4 bushels per acre—convincing evidence of the high standard of farming throughout the district. The average yield in each competition was:—Grenfell 34 bus., Ooma Agricultural Bureau 32½ bus., Tyagong Agricultural Bureau 30.4 bus., Cudal 31.6 bus., Canowindra 31.7 bus., Molong 28¾ bus., Eugowra 29 bus., Cowra (open competition) 31 bus. and Cowra (640-acre competition) 34¼ bus.

The average for the Grenfell competition of 34 bus. for twenty-two entries (not one of which was below 30 bus.) is remarkably high, as is also the average of 32.3 bus. for the forty-eight entries in the three competitions in the Grenfell district (Grenfell, Tyagong and Ooma). The twenty-seven blocks which occupied the first three positions in the nine competitions averaged 35 bus. per acre. Three were estimated to yield 39 bus. and three 38 bus.

Although the season was very satisfactory and conducive to high yields the excellent averages in these competitions could only be obtained by the employment of good farming methods. Wheat-growing competitions have been invaluable in focussing attention on these methods and have been responsible for raising the standard of farming very considerably in the last decade.

Mudgee-Coonabarabran District.

G. NICHOLSON, H.D.A., Senior Agricultural Instructor.

In the mid-western district the following agricultural societies conducted crop competitions: Mendooran (17 entries), Coonabarabran (8 entries), Dunedoo (9 entries), and Tambar Springs Agricultural Bureau (11 entries).

Factors responsible for a falling off of interest in competitions this year were the dry spring and the consequent uncertainty of the crops finishing satisfactorily, and the financial position of many farmers, who were forced to cut down cultivation costs to a minimum.

The Season.

The seasonal rainfall, though presenting many problems, was on the whole favourable to crop production. Wheat-growers who failed to burn off early and take advantage of the favourable conditions for summer fallowing in January were later confronted with the difficult task of dealing with a weed-infested stubble and preparing a seed bed under very wet conditions. The

heavy and persistent rainfall from the commencement of May until July considerably hampered seeding operations. Many of the light loams became waterlogged, the crops failed to stool normally and leaf spot was prevalent. The heavy rains ceased about mid-July, and then followed a dry period until mid-November. Favoured with mild day temperatures, and cool nights, and an absence of hot windy weather, the crops were able to draw fully on the moisture reserves in the subsoil, mature normally, and fill a bright attractive grain sample.

The season has been distinctly favourable for the heavier and better-drained types of soil. Growth was prolific during the wet period, and then when the dry weather set in the reserves of moisture were sufficient to carry the crops to a successful maturity. On the other hand, the light water-logged soils dried out rapidly on the surface, and formed a hard crust; the result was thin, and spindly low-yielding crops.

RAINFALL Table.

	Mendooran.	Coonabarabran.	Dunedoo.	Tambar Springs.
	points.	points.	points.	points.
Summer Fallow Period—(January to March, 1931) ...	995	653	812	820
Crop Growing Period—1931.				
April...	404	262	399	750
May	320	423	608	710
June	313	598	317	675
July	92	62	166	30
August	37	73	52	150
September	58	57	90	35
October	41	13	42	5
Total on Crop ...	1,265	1,488	1,674	2,355
Grand Total	2,260	2,141	2,486	3,175

Varieties.

It is gratifying to record that only ten varieties were chosen by competitors, and all of these are recommended by the Department of Agriculture for the respective districts covered by the competitions. By far the most popular were: Nabawa with 55.5 per cent. of the entries, Waratah 25.5 per cent., and Marshall's No. 3 with 5 per cent. This leaves only 14 per cent. of the total entries to represent the other seven varieties. It is therefore not surprising that Nabawa and Waratah filled nearly all the leading positions.

For the four competitions the placed varieties were:

Firsts—Nabawa 3½, Waratah ½.
Seconds—Nabawa 2½, Waratah ½, Riverina 1.
Thirds—Nabawa, 4.

Nabawa has done excellently on the well-drained soils, but it was somewhat disappointing on soils that were heavily charged with moisture during

the winter months. It is susceptible to leaf spot, but otherwise is very disease-resistant. The infection of flag smut was negligible. Nabawa appears to be more susceptible to frost damage than many other varieties, and should therefore not be sown too early, unless forward growth is checked by feeding off. Waratah continues to give good returns, but does best on the heavy soils, while Marshall's No. 3 is more suited to the lighter soils. One entry of Ford appeared very promising, but, considering the season, had been sown a trifle on the late side. The season, undoubtedly, favoured the early maturing types of wheat that were sown reasonably early. Some growers resorted to feeding-off in order to check too forward growth. This was a wise precaution, since many of the very early crops suffered severe frost damage, both in the straw and ear. There is, however, a tendency to delay feeding off until too late in the season, and to prolong the grazing period. A number of otherwise promising crops were irreparably damaged by grazing by the time the stalk had appeared. This had the effect of killing out the vigorous primary stools and encouraging the weaker secondary growth.

Trueness to Type.

The purity and type of seed used by many competitors was far from satisfactory. As many crops are grown on stubble land, it is a problem to keep varieties pure unless special precautions are taken. Only 26 per cent. of the crops conformed with the pure seed standard, while 25 per cent. were of a very inferior type. Since it is usual that only the best crops are submitted to the judge, a large quantity of inferior quality seed must be used for sowing the bulk of the wheat area.

It is surprising that 33 per cent. of the crops were grown from ungraded seed. Apart from any other advantage, the necessity for grading to eliminate wild oats is important. Ungraded seed is a common source, whereby clean country quickly becomes weed infested, and this was most noticeable on three blocks, carrying only the second crop of wheat.

Rate of Seeding.

The quantity of seed used was similar to that of last year.

	Maximum.	Minimum.	Average.
	lb.	lb.	lb.
Mendooran	62	48	54
Coonabarabran	60	50	57
Dunedoo	60	45	55
Tambar Springs	60	39	46

Fertilisers.

Up to the present superphosphate has not been used extensively in this part of the State, and this year, because of the financial position, the area sown with manure was further reduced. Four entries only were manured,

using on the average of 60 lb. superphosphate per acre. The heavy rich soils show very little response to superphosphate, but good results have been obtained on the medium loams that have been under cultivation for some years.

Cultivation.

A number of crops were grown with a minimum of cultivation. This season the important contributing factors to heavy yields were a medium to heavy, fertile, well-drained soil free from weed growth, early sowing and the use of early to mid-season varieties. The heavy rains extending from March to July thoroughly saturated fallow and non-fallow land alike. The wheat-grower who is in the fortunate position of having ample new land to crop and can periodically spell the old cultivation paddocks for some years may be able to carry on with a measure of success without resorting to fallow. Cultivation paddocks, thickly weed infested, to be seen throughout the district are sufficient evidence that cultivation practices have not been all that could be desired. No less than 67 per cent. of the entries were grown on comparatively new land, which, combined with the rainfall, helped to minimise the effects of scanty cultivation. Crops showing to advantage were those grown on land that had been ploughed early and cultivated in March, prior to sowing. Only 12 per cent. of the crops were grown on winter fallowed land. The fallowed soils were light to medium in texture, and, apart from these, the lighter soil types did not feature prominently in the competitions. Much can be accomplished in some sections of the district with a short summer fallow, but the main essential is early ploughing. When ploughing is delayed until March and April, this is not summer fallow, and crops sown on such land are wholly dependant on the vagaries of the season.

Disease.

The most prevalent disease was foot-rot, which was most noticeable in heavy yielding crops grown on the friable chocolate basaltic loams. All varieties appear to be susceptible, but Nabawa, and to a less extent Waratah, showed the greatest amount of infection. Loose smut was more widespread than in former years. Only one competitor favoured formalin for pickling as a preventive of ball smut, and two crops were sown with untreated seed. Bunt infection was noticeable in two crops, one grown from unpickled seed and the other treated with copper carbonate.

Crops of Waratah, Marshall's No. 3, Canberra, and Yandilla King were only lightly affected by flag smut, the amount of infection being less than last year. The only crop showing a moderate amount of infection was grown on stubble that had not been thoroughly burnt off. Wherever patches of old straw had accumulated, flag smut infection was most marked. Nabawa, Riverina, and Ford were very free from infection, although a very occasional plant of the first-mentioned variety was observed to be diseased.

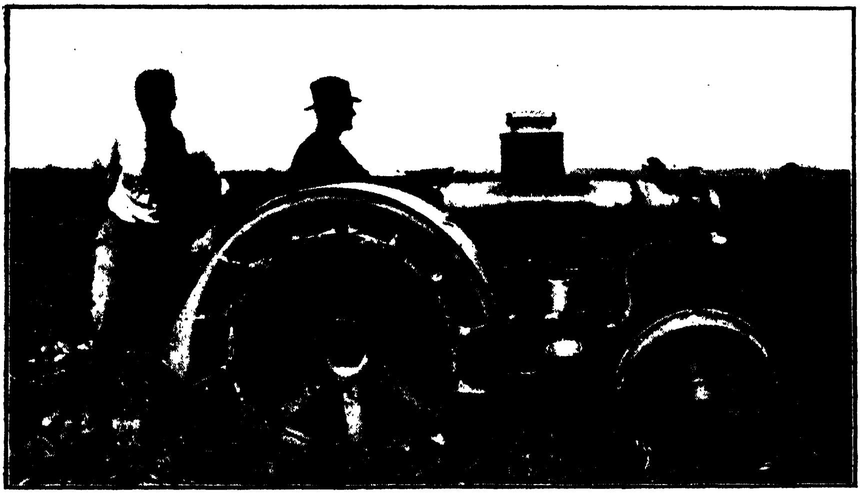
Charcoal-gas Fuel for Tractors.

TRIALS AT HAWKESBURY AGRICULTURAL COLLEGE.

A. H. E. McDONALD, Director of Agriculture.

THE excessive cost of kerosene and petrol has forced many farmers to lay aside their tractors. Particular interest, therefore, attaches to efforts which are being made to utilise gas produced from charcoal for driving tractors.

This fuel has been used for many years for stationary plants, and is generally recognised as the cheapest available. Hitherto it has not been successfully used for motor power on an extensive scale. Mr. W. Hart has now designed a generator which has been adapted to the Fordson tractor and, working in co-operation with Motor Tractors Limited, has had a tractor operating at the Hawkesbury Agricultural College for some weeks.



A Tractor Fitted with Charcoal Gas Generator.

The apparatus, which is attached to a standard type Fordson, is compact and simple, and requires no mechanical skill on the part of the operator. The tractor is fitted with the ordinary compression head, giving 77 lb. compression in the combustion chamber. The charcoal is burnt in the main generator, and the gas then passes through a centrifugal cleaner where most of the dust is arrested. The gas passes on through a series of radiator tubes placed in front of the radiator for cooling. It then passes through an oil cleaner where the smaller particles of foreign matter lodge before the gas goes on to a horse-hair filter. Finally the gas passes into the mixing chamber where a clean volatile mixture is prepared for combustion.

The joints in the gas fuel line are strongly and ingeniously made in such a way that no leakages develop even under the roughest working conditions. There is no danger from fire, and the tractor itself runs in a much cooler condition than when operated on kerosene fuel. The nature of the gas necessarily ensures that there is no crank case dilution, and maintenance costs are reduced.

The tractor is started on charcoal gas without the preliminary use of petrol or kerosene, and can be started from cold in about ten minutes. Once started, the engine can be made to idle for as long as desired and can be quickly brought up to full power.

Only a small quantity of water—1 gallon per acre—is required. The apparatus has been designed to permit of the use of any kind of water, including muddy or salt water. The ordinary equipment of the tractor is not disarranged, and consequently the use of kerosene fuel can be reverted to if desired at any time.

In order to test the power generated, a trial was recently made at Hawkesbury Agricultural College with two Fordsons of similar type, one driven by charcoal-gas and the other by kerosene. A four-furrow disc plough was drawn by each tractor. The soil was a clay loam in fairly favourable condition for ploughing. The depth of ploughing was 4 inches, and it is estimated that each tractor was doing work that would require about six horses. An area of 2 acres was ploughed by each. The charcoal-gas tractor travelled at the rate of 2.56 miles per hour and ploughed 2 acres in two hours thirty minutes, the rate being .8 acres per hour. The consumption of charcoal was 24 lb. per acre and 1 gallon of water. The kerosene-driven tractor travelled at the rate of 2.8 miles per hour and ploughed 2 acres in two hours sixteen minutes, the rate being .88 acres per hour. It consumed 2½ gallons of kerosene per acre.

The charcoal-gas driven tractor created a very favourable impression, and gives promise of being a means by which farmers can utilise cheap fuel. Charcoal can be bought for about £2 10s. per ton, or can be made by farmers without any difficulty.

Infectious Diseases Reported in December.

The following outbreaks of the more important infectious diseases were reported during the month of December, 1931:—

Anthrax	**3**
Blackleg	**6**
Piroplasmosis (tick fever)	**1**
Pleuro-pneumonia contagiosa	**5**
Swine fever	**Nil.**
Contagious pneumonia	**5**
Necrotic enteritis	**Nil.**

—**Max Henry, Chief Veterinary Surgeon.**

Planting of Maize.

SURFACE VERSUS FURROW METHOD AT RICHMOND.

J. A. WILLIAMSON, H.D.A., Experimentalist, Hawkesbury Agricultural College.

DURING the past six years trials have been carried out at Hawkesbury Agricultural College to determine whether surface or furrow sowing of maize is the better method. With surface sowing, the maize is planted with a maize dropper 2 inches below soil surface level in the ordinary way, while the furrow-sowing method consists of sowing with a maize dropper 2 inches below the bottom of a recently-opened 3-inch furrow, the furrow being opened by means of a double mouldboard plough, which throws a furrow away from each side of the centre beam.

The Seasons.

A fair cycle of seasonal conditions were experienced during the period over which the trials extended—a good season in 1927-28, three seasons with dry springs and summers and wet autumns in 1925-26, 1928-29, and 1930-31, one season with a wet spring and summer and dry autumn in 1929-30, and a season with a dry spring, wet summer, and fairly dry autumn in 1926-27. Thus half of the six seasons under review had dry springs and summers and wet autumns.

TABLE I.—Rainfall at Hawkesbury College each season during Period 1925 to 1931.

Month.	1925-26.		1926-27.		1927-28.		1928-29.		1929-30.		1930-31.	
	Fallow.	Crop.	Fallow.	Crop.	Fallow.	Crop.	Fallow.	Crop.	Fallow.	Crop.	Fallow.	Crop.
	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.
July ...	...	...	66	...	...	...	...	...	97	...	60	...
August ...	193	...	79	...	...	...	21	...	161	...	177	...
September	26	...	145	...	69	...	19	...	328	...	12	...
October ...	80	...	...	29	180	...	116	28	594	24	106	55
November	327	...	...	13	...	614	...	53	...	287	...	82
December	...	177	...	497	...	215	...	126	...	140	...	393
January	...	122	...	374	...	187	...	29	...	296	...	208
February	...	16	...	15	...	645	...	1,129	...	60	...	275
March ...	...	856	...	186	...	382	...	153	...	261	...	543
April ...	...	267	...	951	...	194	...	351	...	97	...	381
May ...	...	187	...	47	...	1	...	62	...	168	...	271
Total ...	626	1,625	290	2,112	249	2,238	156	1,931	1,180	1,333	355	2,208

Cultural Details.

The soil on which the trials were sown is a deep alluvial clay loam of a fairly uniform nature, which had been growing lucerne prior to 1923, since which year it has been cropped with maize each season.

TABLE II.—Yields per Acre obtained each season, 1925 to 1931.

Treatment.	1925–26.		1926–27.		1927–28.		1928–29.		1929–30.		1930–31.		Average.	
	Actual Yield.	Per cent.	Actual Yield.	Per cent.	Actual Yield.	Per cent.	Actual Yield.	Per cent.	Actual Yield.	Per cent.	Actual Yield.	Per cent.	Actual Yield.	Per cent.
	bus. lb.		bus. lb.		bus. lb.		bus. lb.		bus. lb.		bus. lb.		bus. lb.	
Furrow sown	18 9	142	60 28	122	76 30	116	30 21	119	45 14	129	43 0	128	45 36	125
Surface sown	12 44	100	49 29	100	65 33	100	27 2	100	35 1	100	33 30	100	37 14	100

TABLE III—Net Gain per Acre of Furrow-sown compared with Surface-sown Maize.

Furrow-sown.	1925–26.	1926–27.	1927–28.	1928–29.	1929–30.	1930–31.	Average.
Yield increase	5 bus. 21 lb.	10 bus. 55 lb.	10 bus. 53 lb.	3 bus. 19 lb.	10 bus. 13 lb.	9 bus. 26 lb.	8 bus. 22 lb.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Bushel value	6 0	6 6	4 6	4 9	5 10	3 2	5 1½
Increase value	32 3	71 4½	49 3	15 10	59 8	29 11½	43 9
*Increase cost	4 9½	4 9½	4 9½	4 9½	4 9½	4 9½	4 9½
Net gain	27 5½	66 7	44 5½	11 0½	54 10½	25 2	38 11½

* Opening furrows with plough costs 4s. 9½d. per acre.

Immediately after each harvest the maize stalks were chopped with a chopping roller, raked and burnt, and the land fallow ploughed, usually during late June or July. In spring, the land was reploughed, rolled, harrowed, and cultivated as deemed necessary to prepare the seed bed.

The maize was usually sown during October. Large Red Hogan was used in all cases, being sown at the rate of 9½ lb. seed per acre with a maize dropper in rows 4 feet 6 inches apart.

The maize was cultivated when necessary to keep down weeds and conserve moisture, the cultivator being confined to the centre of the space between rows as the crop increased in growth. No cultivations were made after tasselling. The crop was gradually hilled during the later cultivations. The plots were harvested by hand, generally during late May or June.

Yields.

The yields obtained each season are shown in Table II. It will be noted that in all seasons the furrow-sown method increased the yield as compared with the surface method. The net gain by the furrow method as compared with the surface method is shown in Table III.

These results indicate that the furrow method of sowing maize has consistently outyielded the surface method in both good and bad seasons during the past six years, and the more adverse the season the greater the difference in favour of the furrow method. The average increased yield was 8 bus. 22 lb. per acre, representing an increased return of £1 18s. 11½d. per acre. In the furrow method the maize is sown at the bottom of a freshly opened furrow and in immediate contact with the moisture in the subsurface soil, which results in better germination in a dry spring.

The roots of the furrow-sown maize were found to be deeper and to extend farther, and less damage was done by cultivator tines to the lateral roots arising from the main upper roots. This means that the foraging area of furrow-sown plants is greater than surface-sown plants. Furthermore, the better root hold obtained by the furrow method is a factor of importance if boisterous windy weather is experienced, and the smothering of weeds in the rows by the early cultivation is also an advantage obtained by the furrow method. It must be remembered that these results have been obtained under comparatively low rainfall conditions as regards maize growing, and it is again stressed that the drier the season the greater the difference in favour of the furrow method. In districts where heavy spring and summer rains are the rule, the furrow system might be detrimental owing to the liability of the furrows becoming waterlogged before the germination or growth of the maize. A disadvantage of the furrow system experienced at Hawkesbury Agricultural College was the liability of the furrows to set hard at the bottoms before the maize germinated. To break this crust a special frame with harrow tines adjustable to the distance apart of the furrows was found necessary, as an ordinary harrow would not reach the bottom of the furrows.

General Conclusions.

In conclusion, the advantages of the furrow system may not be so marked when shallow spring cultivation is the rule, but when the spring cultivation tends to be fairly deep, as in the maize-growing areas at and adjacent to the Hawkesbury Agricultural College, Richmond, and when the rainfall is moderate, the furrow method of sowing maize can be safely recommended in preference to the surface-sowing method.

Heavy Mortality in Bees due to Nosema Disease.

Recently Mr. A. Varney, of Coonabarabran, noticed heavy mortality among bees working red gum blossoms, and on submitting some of the bees to the Department it was discovered that the trouble was due to Nosema aphis, large numbers of which were found in the stomachs of the dead bees.

Surveying the whole position, Mr. W. A. Goodacre, Senior Apiary Instructor, remarks that peculiar seasonal conditions in the first instance most likely weakened the vitality of the bees, leaving them open to parasitic infestation by Nosema aphis, which is the organism responsible for the condition known as Nosema disease. Subsequent feeding on the red gum nectar or pollen evidently aggravated the trouble, causing heavy mortality in the bees already weakened by parasitic infestation. Mr. Goodacre observes, however, that it is the first definite case that has come to his knowledge of heavy mortality from Nosema occurring amongst bees whilst working the flora for food supply, and suggests that the incident perhaps offers an explanation of what is known as the "disappearing trouble." The bees leave the apiary apparently healthy and die whilst working the blossoms, thus giving the apiarist no indication as to the reason for their disappearance.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Berry (Geo. Gillam)	Feb.	5, 6	Goulburn (T. Higgins)	Mar.	10, 11, 12
Nowra (R. King)	„	11, 12, 13	Bowral (E. Waine)	„	11, 12
Pambula (L. K. Longhurst) ...	„	12, 13	Gunnedah (M. G. Tweedie) ...	„	15, 16
Milton (G. Prior)	„	17, 18	Gloucester (M. Newton)	„	16, 17
Bega (A. O. Manns)	„	24, 25	Muswellbrook (C. R. Sawkins) ...	„	16, 17, 18
Uralla (D. G. Evans)	„	24, 25	Crookwell (A. G. McDonald) ...	„	17, 18, 19
Newcastle (P. G. Legoe)	„	24 to 27	Sydney Royal (G. C. Somerville) ...	„	21 to 30
Gunning (G. E. Ardill)	„	25, 26, 27	Kempsey (E. E. Mitchell) ...	April	6, 7, 8
Robertson (W. G. Jenkin) ...	„	26, 27	Taree (C. A. Jackson)	„	7, 8, 9
Campbelltown (R. A. Sidman) ...	„	26, 27	Bowraville (A. H. Newman) ...	„	12, 13
Tumut (Milton Archer)	Mar.	1, 2	Orange (Geo. T. Williams) ...	„	12, 13, 14
Taralga (W. N. Fitzgibbons) ...	„	1, 2	Wingham (C. H. Blenkin) ...	„	13, 14
Mudgee (T. P. Gallagher)	„	1, 2, 3	Grafton (L. C. Lawson)	„	13 to 16
Cooma (G. E. Metcalfe)	„	2, 3	Maclean (T. B. Notley)	„	20, 21
Dorrigo (A. C. Newman)	„	2, 3	Macksville (P. R. Larkey)... ...	„	26, 27
Braidwood (H. E. Roberts) ...	„	2, 3	Casino (E. J. Pollock)	„	27, 28, 29
Maitland (M. A. Brown)	„	2 to 5	Gresford (A. R. Brown)	„	29, 30
Oberon (F. H. Kelly)	„	3, 4	Cootamundra Sheep Show (G. B. Black)	July	20, 21
Moss Vale (H. Richardson) ...	„	3, 4, 5	Berrigan (R. Wardrop)	Sept.	28
Gundagai (W. J. Sullivan) ...	„	8, 9	Narrandera (J. D. Newth) ...	Oct.	4, 5
Moruya (H. P. Jeffery)	„	8, 9	Cootamundra (G. B. Black) ...	„	25, 26
Dungog (W. H. Green)	„	9, 10, 11			
Camden (G. V. Sidman)	„	10, 11, 12			

Further Observations on Pollination and Seed Setting in Lucerne.

R. E. P. DWYER, B.Sc.Agr., Assistant Plant Breeder, and S. L. ALLMAN, B.Sc.Agr.' Assistant Entomologist.

A PREVIOUS paper (see *Agricultural Gazette*, September, 1931, page 703) was chiefly concerned with the question of seed setting in lucerne, indicating rather the environmental conditions which are considered necessary to bring about the best results. Although there are many problems in this connection which demand further investigation, the significance of additional observations on lucerne pollination has made it desirable to record the results here.

The problem that particularly concerns the plant breeder is not so much what environmental conditions determine seed-setting in lucerne as what agencies or causes are responsible for the pollination and fertilisation of the lucerne flower, to what extent self- or cross-pollination occurs and how it is influenced by these agencies. The variability that is seen in a lucerne field of any so-called variety of lucerne, together with the variable progeny obtained from the seed of a single plant, is sufficient evidence that cross-fertilisation occurs abundantly in lucerne, although the flower may appear to lend itself to self-fertilisation, and although self-fertilisation does also take place.

Since it is of considerable moment for the plant breeder to determine what agencies may effect self- or cross-pollination in lucerne, the writers have been engaged on investigations at Bathurst in order to throw more light on this subject.

Extent of Natural Crossing.

The extent to which natural cross-fertilisation occurs in lucerne is still a matter for conjecture and the data available are comparatively meagre.

Fruwirth, Urban and Hansen, on the authority of Babcock[2], have stated that common lucerne (*Medicago sativa*) is very subject to crossing with sand lucerne (*M. falcata*), giving rise to hybrid forms.

Waldron[13] in North Dakota in 1919 in a natural cross-pollination test obtained 7.5 per cent. hybrids in the blue-flowered common lucerne and 42.75 per cent. hybrids in the yellow-flowered sand lucerne. In 1929 he reported that at least three factors are involved in the inheritance of flower

ACKNOWLEDGMENT.—The authors wish to express their thanks to Mr. R. G. May, Manager, Bathurst Experiment Farm, for helpful assistance and suggestions, and for careful revision of this paper. Thanks are also due to Mr. T. Mau, Junior Agrostologist, for assistance given.

colour and that its genetical basis, in these forms, is very complicated. As dominance is entirely lacking and the many intermediate forms render accurate grouping difficult, some doubt as to application of the above figures must be entertained.

Hayes and Garber[6] include lucerne among the often cross-pollinated plants, and in commenting on Waldron's figures state that "a part of the difference in results is doubtless due to the smaller number of flowers produced and the prostrate habit" of the sand lucerne.

Fleischmann[4] observes that as a result of hybridisation the most diverse gradations of flower colour occur in the field.

Yaroshevsky[15] includes lucerne among the least inclined (of the leguminoseae) to self-fertilisation, but not to the same degree as red clover.

Jenkins[7] states that cross-pollination is the natural mode of reproduction in lucerne, although self-fertilisation may take place to quite a considerable extent.

Effect of Cross-fertilisation on Seed Setting.

It has been generally proved by investigators that cross-pollination, either by the same or a different variety, has led to an increased seed set.

Piper[9] records a decided increase in favour of crossing, although he states that good seed sets may be obtained where the natural cross-fertilising agencies are scarce.

Carlson[2] agrees with this statement, and quotes Frandsen, who records a gain of 246 per cent. in the average number of seeds formed per pod when compared with pods from self-fertilised plants.

Torsell[13] cites a 20 to 50 per cent. increase in seed set from crossed flowers.

Structure and Functioning of the Lucerne Flower.

The structure of the lucerne flower has been well described by numerous investigators. The sexual parts are enclosed under tension within the keel, which is further reinforced by the closely associated wing petals, each of which has a knob-like projection fitting into an invagination on the keel. It can be surmised that there are two main tensions to consider, namely, the dynamic or elastic pressure of the staminal column and the static resisting pressure of the unopened keel, which, as above stated, is closely associated with the wing petals. The pistil when examined appears quite soft, although strengthened and curved where it protrudes from the column. The tension is due to the curvature of the combined stamens formed into a tube, with one free stamen leaving an opening on the side nearest the standard. Undoubtedly cell tension plays a big part in assisting this mechanism, and this, together with the possible lack of viability in pollen, may explain the exacting requirements of the lucerne plants as regards rainfall, temperature, etc., for tripping and pollination.

It is possible to sever the single stamen, the pistil, and the wing petals without causing tripping. The claspers of the wing petals may also be lifted clear of the staminal tube, and, according to Piper*, the whole wings may actually be removed without this result. Cutting through the keel near the base of the flower immediately induces the curvature of the staminal column, even though the keel does not open and is merely carried forward by the released tension.

A microscopical examination of the wings reveals a well-developed vascular system concentrated in the knob-like processes which fit into the investigations of the keel. This system, which appears to be associated with water conduction, should exert varying pressures according to the moisture available.

Effect of Temperature on Tripping.—By the application of heat, as the use of a magnifying glass or the proximity of a lighted cigarette, automatic tripping is easily demonstrated. This reaction should therefore result from the loss of moisture and consequent diminution of cell tension. Dipping in 70 per cent. alcohol, presumably also causing lessening of cell tension, caused an almost immediate tripping.

Laboratory tests involving temperatures under varying conditions of humidity were also carried out. In an ordinary drying oven first tripping commenced at 101 deg. Fahr., and instantaneous tripping of all flowers was obtained at 104 deg. Fahr. and upwards. Flowers suspended in steam over heated water commenced tripping at 102 deg. Fah. Flowers actually immersed in water which had been heated commenced tripping at 100 deg. Fahr., and with increasing facility as the water used was made warmer, until all the matured flowers tripped at the maximum temperature of 108 deg. Fahr.

These preliminary investigations indicate that temperature exercises a very decided influence on the tripping of lucerne flowers. The temperatures given are frequently exceeded in direct sunlight during the summer months, and this direct heat is considered of more importance than that indicated by the figures obtained from standard louvred meteorological boxes.

It is of interest to note that the tripping commenced at approximately the same temperature under the most diverse moisture conditions, namely, of a drying oven and actual suspension in steam and water. However, unless flowers have previously reached a certain stage of turgidity induced by favourable moisture conditions this temperature factor may be largely nullified.

Examination of Pollen.

Lucerne pollen consists of rounded, semi-hyaline and finely pitted small grains.

Germination chambers were formed of petri dishes containing a piece of damp cotton wool to secure an adequate moisture supply. The medium used

was a 1 per cent. agar containing 12 per cent. cane sugar. At a room temperature of 80 deg. Fahr., the pollen germinated readily in approximately two hours.

During the past season the pollen examined appeared quite healthy and viable.

Further investigations dealing with viability, age, optimum germination temperatures and other factors are proposed.

Natural Agencies of Cross-pollination.

Wind.—Previous investigators have attached very little importance to wind or the air transmission of pollen as an agent in the cross-pollination of lucerne. Roberts and Freeman[10] state that the shaking of the flower stems by wind may scatter some pollen. Piper[9] considers that wind causes only a very limited amount of tripping in lucerne. Aicher[1] reports that wind aids the tripping of the flowers to some extent and therefore helps to increase the amount of seed set. Gray[5] found that wind was a very poor tripping agent except in the most unusual cases, such as isolated plants growing near a shrub or fence, or in the open field where the outer stems may be whipped against the ground. Stewart[11] mentions moderate wind in connection with other agencies as assisting the seed set.

The authors have observed that flowers held immediately over a dark piece of paper and tripped mechanically, exploded with such violence as to spread the pollen over a circle with a radius of approximately 5 inches. Wind and elevation would very materially increase this spread, as was demonstrated by tripping flowers in the field under the required conditions. This dispersal of pollen by artificial or automatic tripping throws some doubt on the widely-accepted view that tripping by insects brings about cross-fertilisation and that automatic tripping results in self-fertilisation. On one occasion, an examination of the standards of untripped flowers disclosed the fact that all had at least a few adhering pollen grains, thus establishing the possibility of natural crossing without the direct influence of insects in the act of tripping. This increase of radius of spread of pollen by virtue of elevation and wind may quite well explain why Waldron[13] obtained a 40 per cent. natural crossing in the case of the prostrates and lucerne (*Medicago falcata*) and only a 7 per cent. crossing in the opposite direction with the more upright common lucerne (*M. sativa*).

The fact that bees and other insects have also played their part in this dissemination of pollen to untripped flowers must not be overlooked, and it is not suggested that wind alone is responsible for the universal presence of pollen on the standards of the flowers examined. The actual tripping of the flowers by bees and allied types would very materially increase the spread by this agency. It is important, however, to find that the explosive mechanism may be directly responsible for cross-pollination, the extent of which has not yet been conclusively demonstrated.

Rain.—Although it is possible that rain drops may carry pollen from one flower to another, and in exceptional cases even assist in tripping, this factor is not considered important on account of the poor viability of pollen under such conditions. Martin[6] states that above or below a certain moisture requirement pollen will not germinate. He also intimates that pollen will germinate in the flowers if the plants are stored in a moist chamber. This same lack of viability under excessive moisture conditions has also been found to obtain for fruit pollen.

Delayed Tripping.—This phenomenon disclosed a further possible factor in cross-pollination. In odd instances, and at comparatively low sun temperatures, flowers commenced to open at the tip of the keel, thus exposing the anthers. This slow automatic tripping took from one half to one hour in the field. In cages this period was considerably lengthened and ranged up to twenty-four hours. In all cases the anthers were sufficiently exposed to allow transference of pollen by visiting insects.

The possibility of insect injury to the enclosed flower parts may be involved in this slow tripping, in addition to the other factors, such as temperature and moisture.

Other Agencies.—Man and various animals may play some part in self or cross-pollination by mechanical tripping and dispersal of pollen in passing through a field. Where hand tripping is being practised an appreciable amount of cross-pollination may occur.

Summary.

Although natural crossing of lucerne is known to occur, the exact extent and agencies involved are still the subject of some conjecture.

The main tension in the flower is concentrated in the curved staminal column.

A well-developed vascular system is developed in the wings of the flower petals.

In the field the application of heat causes automatic tripping. This same result is achieved by dipping the flowers in alcohol.

In the laboratory, under varying conditions of humidity, flowers tripped readily at temperatures ranging from 100 to 108 deg. Fahr. These temperatures are frequently exceeded in direct sunlight during the summer months.

Pollen is scattered for a considerable distance following mechanical tripping. Wind is considered as very likely to increase this radius of spread.

Pollen was frequently observed on the standards of untripped flowers, and was found to germinate readily.

Rain is considered unimportant from a pollinating point of view, especially as excessive moisture inhibits pollen germination.

Delayed tripping, with exposure of the anthers, was noted both in the open and under cages.

Various miscellaneous agencies may play some part by the mechanical tripping and dispersal of pollen.

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Powdery Mildew of the Apple.

Experiments for its Control.

W. A. BIRMINGHAM, Assistant Biologist, and H. BROADFOOT, Special Fruit Instructor.

POWDERY mildew of the apple, caused by the fungus *Podosphaera leucotricha* (Ell. et Ev.) Salmon, was first recorded for the State of New South Wales, as far as the authors have been able to trace, in 1892. It now occurs on the South Coast, Northern, Southern, and Central Tableland, South-western and North-western Slopes, North-western Plains, and in the metropolitan districts. All varieties appear to be susceptible to attack, some more so than others. Jonathan, Cox's Orange, Sturmer, Cleopatra, London Pippin, Gravenstein, and Northern Spy may be severely affected, and the varieties which have been recorded as possessing resistance are Delicious, Rokewood, Buncombe, Fameuse, Twenty Ounce, Shepherd's Perfection, Tasma, Dunn's, Mobb's Royal, Winter Permain, Hoover, and Crofton. The conidial stage only of the fungus has been found in this State as far as the authors are aware.

The Appearance of the Disease on the Host.

Trees attacked by the disease present a very sickly appearance, and may become partially or almost completely defoliated. The fungus attacks leaves, shoots, blossom-buds, and fruits. On the leaves the disease is manifested as irregular, white, powdery patches, which may appear on both the upper and lower surfaces and spread until the whole leaf is involved. The leaves then have the appearance of having been dusted with flour. Infected leaves are narrower and longer than normal leaves and may become in-rolled. Later they become scorched in appearance and brittle, and are ultimately shed. Infection spreads from the leaves to the young shoots, which later on are killed, several shoots springing from below the affected area the following season.

Infected blossom-buds are smaller than normal and are covered with the white fungous growth. Infected blossoms appear later than healthy ones, and rarely set any fruit.

The fruits may become infected immediately after blossoming when the skin (epidermis) is very tender and easily damaged. The result of infection is that as the fruit develops, russetted markings, somewhat similar to Bordeaux injury and in some cases indistinguishable from it, appear on the surface. As a result of the formation of cork-like cells in the russetted areas, cracking of the fruit is likely to occur. This is due to inelasticity in these parts, the development and growth pressure of the tissues from within causing ruptures in the injured surface of the fruit.

The Economic Importance of Mildew.

The effect upon the tree is a cumulative one, that is to say, the disease is progressive in the damage it does unless measures are adopted for its

control. These measures should be instituted on the first appearance of the disease, and carried out systematically every year.

Defoliation weakens the tree and results in a reduced or inferior crop; it also interferes with the maturation of the tissues for the following season's crop. The fruit blossoms may be so severely affected that little fruit is set, and the fruit may be so seriously russetted as to reduce its market value considerably. Instances have come under notice where trees have been destroyed because of the ravages of powdery mildew. This could have been avoided had the departmental recommendations for control been adopted.

Fig. 1.—Apple Twig and Leaves affected with Powdery Mildew.

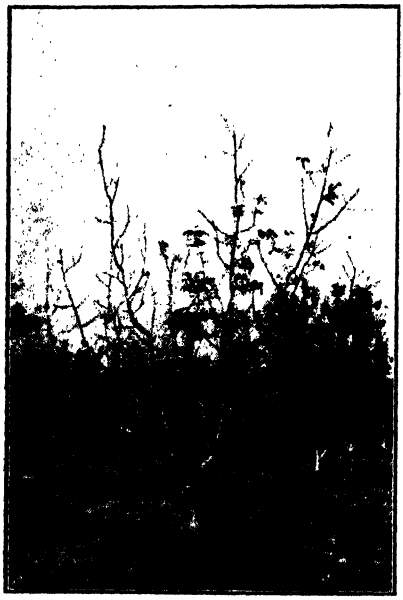


Fig. 2.—Apple Tree defoliated by Powdery Mildew.

An Experiment at Batlow.

In the season 1926, Mr. E. M. Herring kindly consented to place a number of Jonathan apple trees at the disposal of the Department for a series of tests for the control of powdery mildew.

Six plots, each of two trees were used for the experiment, and the spray programmes were as follows:—

Plot 1.—Remove all diseased spurs and tip all diseased shoots.

Plot 2.—Spray with atomic sulphur (10 lb. to 80 gallons water), (*a*) at spur-burst (*b*) combined with lead arsenate applications.

Plot 3.—Atomised sulphur as in Plot 2.

Plot 4.—Colloidal sulphur as in Plot 2.

Plot 5.—Lime-sulphur (1-14) at spur-burst, and lime-sulphur (1-35) in subsequent applications.

Plot 6.—Controls—unsprayed.

These treatments were continued for three years, by which time the control trees were in such a bad state that in fairness to the grower it was decided to terminate the experiment.

The annual reports on the trial submitted by Mr. E. J. S. Clout, Fruit Inspector, who co-operated in carrying out this trial and his observations at the conclusion were to the effect that so far as the Batlow district was concerned, any of the sulphur compounds used, together with tipping and the removal of the diseased spurs, gave good control of the disease.

A Trial at Kentucky.

In 1928 a trial was commenced with the consent of Mr. P. Luxford, of Kentucky, in his orchard in which a large number of the trees had been quite defoliated and in which the majority of the buds were infected. Mr. E. J. Lindsay, Fruit Inspector, co-operated in carrying out this experiment.

Fig. 3.—An Apple Tree carrying a Good Crop although almost defoliated by Powdrey Mildew.

Seven plots, each of six trees of Jonathan, were given the following respective treatments that year, and for the two following seasons.

Plot 1.—Dritomic sulphur (10 lb., 80 gallons of water), (*a*) at spur-burst ; (*b*) combined with lead arsenate applications.

Plot 2.—Atomised sulphur as in Plot 1.

Plot 3.—Colloidal sulphur as in Plot 1.

Plot 4.—Lime-sulphur as in Plot 1.

Plot 5.—Iron sulphide (3 lb. sulphate of iron in solution to 1 gallon of lime-sulphur in 50 gallons of water) just before the buds move, followed by dritomic sulphur (1 lb. to 12 gallons of water) in combination with the "calyx" applications of lead arsenate.

Plot 6.—As in Plot 5, except that 6 lb. of sulphate of iron was added to lime-sulphur (2 gallons to 50 gallons water).

Plot 7.—Controls—untreated.

The untreated trees showed the greatest amount of infection in 1929, and were badly diseased in the other two years. For the first year, dritomic,

atomised, and colloidal sulphur gave the best control of mildew followed by lime-sulphur, but in the other two seasons, lime-sulphur gave the best results and was outstanding in control.

The iron sulphide treatment was not applied in 1930 since the results had not been satisfactory.

Control Measures Recommended.

On the results of these experiments conducted at Batlow and Kentucky, the following spray programme is recommended for the control of powdery mildew:—

1. During the winter pruning, badly mildewed twigs and terminal buds should, as far as possible, be cut out and burned.
2. Spray with lime-sulphur (1-14) at "spur-burst," and use lime-sulphur (1-35) with arsenate of lead applications. Dritomic, atomic, or atomised sulphur may be used at all stages, in the proportion of 10 lb. to 80 gallons of water.

If colloidal sulphur is used it should be prepared as directed in Spray Leaflet No. 9, obtainable free from the Department.

Sow Wheat Varieties at the Right Time.

Heavy losses are occasioned yearly through farmers sowing their wheats at the wrong time. This is due either to the fact that farmers do not know which varieties are early and which are late, or, as is more frequently the case, to a misapprehension of the terms "early" and "late" as applied to varieties of wheat. If it is remembered that "early" wheats are early in maturing, and that "late" wheats are late in maturing, the whole problem is solved. Sow "late" wheats first and "early" wheats last.

The *Farmers' Handbook,* from which the foregoing is taken, has over 150 pages devoted to wheat-growing and deals comprehensively with each of the field crops grown in the State. It can be obtained from the Department, Box 36A. G.P.O., Sydney; price 11s. 6d. posted.

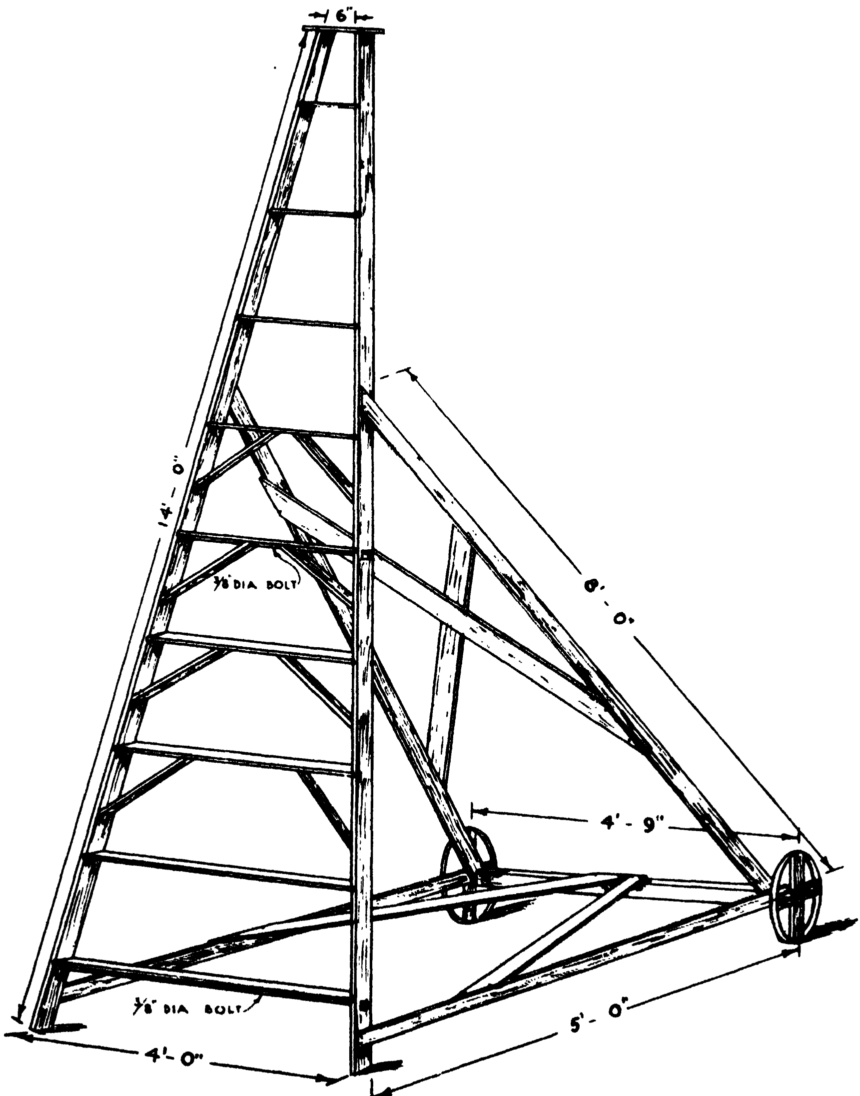
Discing Spoils the Fallow.

The disc cultivator is without doubt the best implement of all to put the fallow in bad condition Admitting its value in destroying large weeds, it is evident that they could almost always have been killed while quite small by the use of other implements. Large weeds are a sign of a neglected fallow. Deep discing ruins the compacted sub-surface layer, and delivers the clods to the bottom and fine soil to the surface, where it is easily crusted by the first rain. As discing is usually done in January or February, not only is the whole physical condition of the fallows practically ruined, but rapid evaporation of moisture results, and there is not sufficient time to restore consolidation unless special means are devised, and they very rarely are.

An Improved Type of Orchard Ladder.

E. C. WHITTAKER, Fruit Inspector, Batlow.

THE ladder described in this artcile was built by Mr. C. Barberie, of Batlow, for use in his orchard, and it is a type particularly suitable for picking or pruning large trees, being much safer, lighter, and easier to



Orchardist's Picking and Pruning Ladder.

handle than the large tripod ladders generally used. Tripod ladders, 12 to 14 feet high, are not at all suitable for such districts as Batlow, where the rich soil causes the trees to grow comparatively high. Apart from the danger to the orchardist in trying to pick or prune these large trees from the tripod ladder, it is so cumbersome that much damage is often occasioned the limbs and fruit spurs when manoeuvring it into position.

The ladder improvised by Mr. Barberie is of simple design, as can be seen from the accompanying sketch. The most important point is to put the main prop from the axle to the ladder well above the centre of balance of the ladder so that there will be no danger of it overbalancing when the operator is on the topmost rungs. Bolts and screws should be used wherever possible in preference to nails, as they ensure a more lasting and satisfactory job.

The main measurements are shown on the sketch. Mountain ash battens (3 inches by 1 inch) are suitable for the framework, and 2-inch by 1-inch battens for the steps. The wheels are made by crossing pieces of 4-inch by 1-inch hardwood and banding them with an iron band about 1 inch wide by ¼ inch thick, which is drilled and screwed on to the hardwood cross-pieces. A hole is bored in the centre of the crossed pieces to take the axle. It is a good idea in order to save wear to screw a small hardwood axle block on to the cross-pieces. When the axle block wears it can be renewed. If it is not desired to go to the trouble of making the wheels, suitable ones could be purchased. They should be not less than 9 or 10 inches in diameter.

The axle should be of steel, but need not be very heavy as there is no great weight to support. To give additional strength and rigidity, however, it is perhaps advisable to bolt the axle to a piece of 3-inch by 2-inch hardwood.

To move the ladder from place to place the orchardist merely picks up the two legs of the ladder and wheels it into position. There is not the least tendency for a ladder of this design to prove unwieldy or bog on newly ploughed or boggy land, even on land on which it is impossible to walk without sinking over the ankles.

Successful Propagation of Sweet Potatoes.

The soundness of the Department's oft-tendered advice to sweet potato growers to propagate by means of rooted plants from tubers has been borne out by the results of experiments carried out during the past three years at Grafton Experiment Farm. During that period trial plots grown from rooted plants from tubers have averaged over 8 tons 5 cwt. per acre, as compared with 7 tons 13 cwt. from cuttings from "present season's" growth, and 1 ton 17 cwt. from cuttings from "past season's" growth

Orchard Notes.

FEBRUARY.

C. G. SAVAGE AND H. BROADFOOT.

DURING February the trees are forming blossom buds, and in order that this tree function may be performed as perfectly as possible every effort should be made to provide favourable conditions. Not the least important part of the orchardist's work in this connection is to maintain the soil around the trees open and loose, for it then acts as a mulch and is a great aid to the conservation of soil moisture.

Budding.

Provided sap is flowing freely, budding may be done during this month. It need hardly be emphasised that only by careful selection of budding wood from proved trees can the best results be obtained. Undesirable varieties can be worked over to suitable sorts, and where young trees have been planted out and cross pollination is necessary, this month is a good time to provide suitable pollinators.

Codling Moth.

Few, if any, growers are unaware of the loss caused by this pest and of the necessity of keeping it in check. During February harvesting the pome fruits is a matter of prime importance, but even this work must not interfere with the treatment for codling moth, nor must this treatment be done in a merely perfunctory manner. All infested fruit must be picked up regularly and burnt or boiled immediately. The destruction of infested fruit is labour in vain if the fruit is kept long enough to allow the grub to escape. The work of destruction must be done whilst the fruit is actually infested.

Cover Crops in Orchards.

For the sowing of cover crops February is the best month. Where the rainfall is slight it is only during an abnormally wet year that cover crops may safely be sown, and even then there is some risk. In districts of high average rainfall the risk is less. Irrigation eliminates risk, but even then it must be remembered that the cover crop, whether a sown crop or weeds, competes with the trees, and additional water must be allowed.

Picking and Packing Pome Fruit.

This is a busy month for pome fruit growers, as many varieties of these fruits will be ready for picking.

Again and again the need for care in these important operations has been stressed. There has been improvement, but in some cases lack of care causes considerable loss. The greater the improvement in these operations the more the careless grower loses by comparison.

In picking and handling more care is necessary. If equipment is not satisfactory it should be improved; the picking bag is essential, though fruit that can be reached from the ground may be placed directly into benzine or other suitable cases.

Pickers should be instructed in the correct method of picking fruit, and reminded of the importance of preserving the skin in a perfectly sound condition. In picking it is necessary to go over the trees several times, as all the fruit does not ripen simultaneously, and the more early ripening fruit will not hang on the tree until the least advanced fruit has matured. It is a great mistake to mix mature and immature fruit in the same case. The grower loses considerably in several ways. The mixture does not appeal to the buyer, and the immature fruit, had it been allowed to hang on for a longer period, would have improved in size, quality, and appearance. Grading, too, consumes more of the packer's time, and to the grower, as well as any other business man, "time is money." Prices obtained for small, immature, poorly-coloured fruit are almost invariably disappointing. Apples which are picked when immature and placed in cold storage are very susceptible to scald and other physiological troubles.

The later varieties of canning and drying peaches, and also late varieties of plums, will be coming in during this month. Prunes, sultanas, and Gordo Blanco grapes will also be fit for drying. Fruit for drying is not fit for treatment until it is thoroughly ripe. Prunes intended for drying should not be gathered until they drop, and raisin grapes should not be harvested until quite sweet.

In orchards where a mechanical sizer is used care should be taken to see that it has been correctly assembled. Necessary adjustments should be made so that nothing shall be lacking to ensure smooth and effective working. Each packing shed should have sufficient floor space. Where a mechanical sizer is not used, the packing table should be commodious, and if movable so much the better. It is impossible to pack two grades and three or four sizes of fruit from a table which will only hold two or three cases of fruit.

The packing shed should be well lighted, otherwise marked fruit is often unintentionally packed with first grade.

The chief points in packing are:—

Pick fruit at right stage of maturity.

Handle carefully.

Grade and pack carefully.

Use clean cases and attractive labels or brands easily decipherable.

A leaflet on the packing of apples, giving diagrams of the various packs, can be obtained free on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Corrugated Cardboard.

The use of corrugated cardboard to line the tops, bottoms and sides of cases usually justifies the additional expense involved, even when costs of

marketing apples and pears are high, as they are at present. The additional expense usually brings increased returns, for the cardboard protects the fruit in transit against bruises. Corrugated cardboard is cleaner than the wood wool, more easily handled, and gives greater protection to the fruit.

Labels for Cases.

The use of a well-designed, artistic label has a great advantage over stencilling, inasmuch as such a label attracts attention and prejudices the prospective buyer in favour of the fruit. It is unfortunate that there is such diversity in the labels used for fruit consigned to oversea buyers. It would, we consider, be better if there were greater uniformity in the labels used—we might, for instance, have a distinguishing label for each fruit district. Some growers object to such a plan, but sooner or later it must be adopted. This plan would simplify the work of sorting, stacking, and cataloguing Australian apples, and would reduce some of the advantages which American apples at present possess in this respect.

Apples for Export.

There are a few points, the observance of which is absolutely essential when fruit is intended for export. The grower should see to it that in his own interests he forwards none but varieties which are suitable for the purpose. They should have been picked with the greatest possible care when properly matured, and if picked during the heat of the day should be allowed to cool before being packed. Only the best specimens should be forwarded, and they should first be graded for size and quality and then packed in clean, new cases, clearly marked in accordance with regulations. When packing see that the packers do not rush things—" raw haste," a distinguished writer tells us, " is half-sister to delay."

Each fruit should be properly wrapped and put carefully into its place. The case should not be finished "slack." The apples should not be so loosely packed that they will rattle if the case is shaken, as this has a very detrimental effect upon the contents. Neither must the contents be packed high above the level of the case edge, or the fruit will be badly damaged when the cover is nailed down. Nailing-down presses are very useful, and enable economical working, but they can be easily abused by anyone who does not realise the necessity of keeping the fruit in good condition. The machines are strong and capable of great pressure, and if they are employed to squeeze down lids on cases which have been packed too high they are used in a manner detrimental to the grower's interest. The nailer-down should be instructed to reject any case so packed that nailing down will prejudicially affect the contents. Wiring of cases is highly desirable.

THE farmer who is to prosper must have capital, writes Theodore Roosevelt. Only the prosperous can really meet the demands of the consumer. In farming, as in every other kind of honest business, the only proper basis of success is benefit to both buyer and seller, producer and consumer.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
H. A. Corderoy, Wynna Park, Comboyne (Guernseys) ...	59	8 Feb., 1932
New England Girls' Grammar School, Armidale	29	10 „ 1932
Lidcombe State Hospital and Home	146	11 „ 1932
New England Experiment Farm, Glen Innes (Ayrshires)	37	12 „ 1932
Bathurst Experiment Farm (Jerseys)	21	16 „ 1932
J. F. Dowe, "Woolomol," Tamworth	59	19 „ 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 „ 1932
Riverina Welfare Farm, Yanco	77	25 „ 1932
Department of Education, Yanco Agricultural High School	33	26 „ 1932
W. M. McLean, Five Islands Road, Unanderra ...	78	27 „ 1932
Mittagong Farm Homes	46	3 Mar., 1932
George Rose, Aylmerton	4	4 „ 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 „ 1932
P. M. Burtenshaw, Killean, Inverell	50	5 „ 1932
Miss Brennan, Arankamp, Bowral	10	6 „ 1932
Koyong School, Moss Vale ...	4	12 „ 1932
G. A. Parish, Jerseyland, Berry	123	13 „ 1932
Lunacy Department, Parramatta Mental Hospital	33	16 „ 1932
Cowra Experiment Farm	32	24 „ 1932
Hawkesbury Agricultural College (Jerseys)	115	25 „ 1932
Rydalmere Mental Hospital	73	25 „ 1932
Russell, Lamrock, Orange ...	4	26 „ 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 „ 1932
St. John's Boys Orphanage, Goulburn	9	26 „ 1932
Marion Hill Convent of Mercy, Goulburn	9	26 „ 1932
Lunacy Department, Kenmore Mental Hospital	79	27 „ 1932
St. Joseph's Girls Orphanage, Kenmore ...	9	27 „ 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn ...	5	26 „ 1932
James Wilkins, Jerseyville, Muswellbrook	39	28 „ 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 „ 1932
Tudor House School, Moss Vale ...	8	3 May, 1932
Australian Missionary College, Cooranbong	53	6 „ 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 „ 1932
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Gratton Experiment Farm (Ayrshires)	193	4 „ 1932
Hurlstone Agricultural High School, Glenfield	53	9 „ 1932
P. Ubrihien, Corridgeree, Bega	133	3 July, 1932
St. John's College, Woodlawn, Lismore ...	32	11 „ 1932
Gladesville Mental Hospital	40	14 „ 1932
William Thompson, Masonic School, Baulkham Hills	45	16 „ 1932
W. Hammond, Bellingen ...	68	16 „ 1932
W. R. Boughton, Holbrook	22	27 „ 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	31	28 „ 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys) ...	42	18 Aug., 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	14 „ 1932
A. L. Logue, Thornbro, Muswellbrook	41	14 „ 1932
E. E. Winder, Wybong Road, Muswellbrook	46	14 „ 1932
A. Shaw, Barrington (Milking Shorthorns)	100	20 „ 1932
A. H. Webb, Quarry-road, Ryde ...	4	24 „ 1932
E. E. McMullen, Springbrook, Holbrook ...	32	25 „ 1932
E. P. Perry, Nundorah, Parkville (Guernseys) ...	30	25 „ 1932
Sacred Heart Convent, Bowral	10	26 „ 1932
Department of Education, Gosford Farm Homes	38	2 Sept., 1932
James McCormack, Tumut ...	98	9 „ 1932
Wagga Experiment Farm (Jerseys) ...	64	16 „ 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 „ 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	67	16 „ 1932
St. Patrick's College, Goulburn	7	21 „ 1932
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 „ 1932
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 Nov., 1932
Wolaroi College, Orange	11	19 „ 1932
Lunacy Department, Callan Park Mental Hospital	31	20 „ 1932
Berry Experiment Farm	129	26 „ 1932
J. L. W. Barton, Wallerawang	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood	8	3 „ 1932
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 „ 1932
Lunacy Department, Morisset Mental Hospital ...	27	7 „ 1932
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 „ 1932
Newington State Hospital and Home	100	17 „ 1932
W. T. Herbert, Racecourse Farm, Bega ...	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega	78	8 „ 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 „ 1933

—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

FEBRUARY.

E. HADLINGTON, Poultry Expert.

FEBRUARY is a good time of the year to take stock of the results of the past hatching season, and to cull out any very backward chickens which are not thriving well. Unfortunately, on many farms there are large numbers of these poorly-reared chickens which have not yet developed to the size of well-reared birds of eight to ten weeks old, and yet, if hatching operations were concluded at the end of September they are now four months old. Frequently these unthrifty chickens are carried on without it being realised that they are not growing as they should, and with the hope that they will develop into payable birds. It should, however, be realised that these birds will remain practically at a standstill until the cooler weather of the autumn commences, and, therefore, the pullets are not likely to come on to lay for at least several months. In fact, very weedy birds may not come into production before next spring, and even then they will not be good layers. Obviously then, the best course is to market them as soon as possible and thus save the cost of feeding.

The Cause of Poor Development.

Th chief reason why the latest-hatched chickens on many farms do not thrive as well as they should is that towards the end of the season the brooders become congested, in some cases through an attempt being made to make up leeway lost earlier in the season. It then becomes necessary to move some of the chickens out into the second stage pens, probably a couple of weeks before they are ready. Then perhaps cold changes occur, which is the usual experience at that time of the year, and these result in the chickens packing together to get warm, causing sweating, which is the beginning of a check in growth and other troubles. Again, late in the hatching season the ground is becoming stale and contaminated, which accentuates the trouble, and chickens hatched after the end of September, if reared under these conditions, suffer to a greater extent than the earlier ones. Moreover, they do not have a chance to develop before the hottest weather of the summer comes, and they remain at a standstill for a couple of months, even under good rearing conditions.

This year the extensive adoption of battery brooding appears to have added to these troubles because of an attempt to rear more chickens than formerly without increasing accommodation in the subsequent stages, and also because the chickens were not handled carefully after they were taken from the batteries.

Still another reason for lack of development of the late chickens is that they are often left too long in small runs after they have learnt to roost. In

this connection it has often been stressed in these Notes that the more range the young birds are given at any time the better will be the result, but this applies tenfold to the late chickens.

The fact that there are annually so many of these badly-reared chickens is bad for both the individual farmer and the industry. Every poultry-farmer should make a survey of his flocks at the present time to ascertain what percentage of last season's chickens do not come up to a reasonable standard, and if it is found that there are many poorly-developed birds, every effort should be made to prevent a repetition next season.

It is only by securing maximum development in the young stock that the physique of the flocks can be maintained to withstand the strain of high production, and, after all, the proper rearing of the chickens is one of the most vital factors in the success of any poultry farm. This work then should be concentrated upon until as near perfection as possible is attained, but this will not be achieved by adopting "factory" methods.

A Warning to Beginners.

There are still numerous people taking up poultry-farming, and many who are only just starting attempt to take a short-cut to obtain some income by purchasing pullets or hens, and at this time of the year often end up by securing a number of chickens of the class described above at what appears to them a cheap price, but when such birds have to be kept for many months before they commence to lay, it is realised that they are expensive at any price. It can be taken as definite that any pullets worth buying at this time of the year cannot be bought cheaply, and even where good early pullets are purchased the buyer cannot depend upon them for a regular income before the middle of the year, because with a change of conditions and management many of them will be almost certain to break into a moult which will put them off laying for at least a couple of months. Again, young stock are likely to contract chicken-pox at any time between now and the end of April, and this will cause a moult and cessation of laying for a similar period. In fact, the purchaser of pullets at this time of the year will be very fortunate if his birds pay for the cost of food before June.

Much the same applies to the purchase of hens, for they would mostly break into moult after being moved from one farm to another, and would not then lay again as early as the pullets. Another disadvantage in buying hens is that their age cannot be definitely determined, and if second-year birds were bought instead of those fifteen to eighteen months old, they would not pay to keep if they broke into a moult. It will be seen, therefore, that it is not a matter of just buying a flock of birds and being assured of an income at once.

Similar conditions would be met with in the case of a person buying a stocked poultry farm during the next month or so, as any alteration in feeding and management of the birds would have the same result, and even under the most favourable circumstances only a very small return could be expected before the spring owing to the fact that this is the period of low production.

The Hawkesbury College Egg-laying Competition.

Intending competitors in the next laying contest at Hawkesbury Agricultural College should note that the committee has made an increase in the minimum weight of Leghorns upon entry from 3½ lb. to 3¾ lb. This was done with a view to maintaining the physique of the breed, and keeping up the size of eggs. Before deciding upon this course an analysis was made of the weight of eggs over the past ten years, and this showed that birds weighing 3¾ lb. and over laid eggs a little heavier in weight than those under 3¾ lb. without loss in production, and birds of over 4 lb. laid larger eggs, but the numbers decreased. This follows closely the summarised results of Canadian laying competitions.

It was felt by the committee that while an odd breeder or two might have difficulty in selecting all birds up to the new weight, there would be few who would not agree that a higher standard was desirable, or who would admit that they could not select birds of the size required, which is certainly not excessive for a bird seven months old. In fact, it has always been a source of comment that some of the small birds in the competitions appeared to be underweight, yet no bird was allowed to remain unless it came up to the 3½ lb. weight.

With the growth of the industry it is imperative that the physique of the flocks be kept up, otherwise high production cannot be maintained, and the competitors in the Hawkesbury Agricultural College contest, representing as they do the leaders of commercial poultry farming of this State, should set a standard for the industry.

Quality of Birds.

In the past a certain amount of latitude has been allowed in connection with the type and quality of the birds entering the competition, particularly in respect to Orpingtons, but it is intended this year to insist on a somewhat higher standard. Competitors should, therefore, pay attention to this matter in order to avoid disappointment and trouble of replacements.

Some of the faults which are common among birds sent to the competition are feathers on shanks or between toes, crooked toes, light eyes, and side sprigs on the comb, etc., all of which would debar the pens from quality prizes. Another factor which should receive even more careful attention is evenness of type. Numerous groups are forwarded in which there are several different types of birds, and this also precludes them from quality prizes. The aim should be to select birds of one type and free from serious faults; otherwise they will not be satisfactory to breed from, irrespective of how many eggs they lay.

THE pig is well adapted for the disposal of many waste foods of the household, farm, orchard, and dairy; but unless these foods are in a sound and wholesome condition serious troubles may be caused by their use, and the quality and market value of the carcase may suffer.

The Farmer's Library.

"Diseases of Tobacco in Southern Rhodesia."

J. C. F. Hopkins' recently published book—"Diseases of Tobacco in Southern Rhodesia"—is a useful contribution to the literature on tobacco-culture. Although primarily written for the guidance of farmers in the prevention and control of tobacco diseases, the mycologist should also find it a useful reference work, for it contains technical descriptions of the causal organisms in each case. The illustrations are numerous and include several excellently reproduced coloured plates.

Our copy from the Department of Agriculture, Southern Rhodesia.

"Vegetables of the Dutch East Indies."

A volume of encyclopaedic proportions (it contains 1006 pages and is copiously illustrated), "Vegetables of the Dutch East Indies," by J. J. Ochse, of the Department of Agriculture, Netherlands East Indies, deals with the innumerable vegetables (including all kinds of edible tubers, bulbs, rhizomes and spices) grown in the Dutch East Indies. Each vegetable is illustrated and fully described, and while very many of them are unknown in Australia they are not without interest, as the cultivation of tropical fruits and vegetables is gaining ground every year in this country. Many of our common vegetables are grown in the East Indies and consequently are featured in this volume.

The Netherlands East Indies Department of Agriculture is to be complimented for having an English edition printed, thus rendering a valuable service to English-speaking countries that are interested in tropical agriculture. The book is an excellent work of reference, and is retailed in Java at 30s.

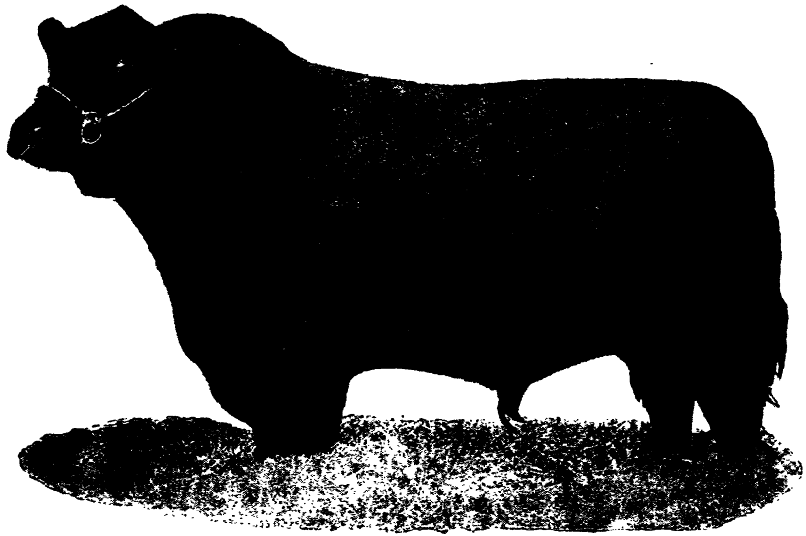
Our copy from the Netherlands East Indies Department of Agriculture.

The Best Book Available on Spraying.

Spraying, like all other jobs in the orchard, is hardly worth while doing at all unless it is done properly. Those in doubt as to the best methods to apply should purchase a copy of the recently revised edition (the ninth) of "Spraying," obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney, or from the Government Printer, Phillip-street, Sydney. The price of this booklet is 1s. 1d., including postage.

As a work of reference on practical agriculture, there is no more comprehensive and up-to-date book than *The Farmers' Handbook*. Price, 11s. 6d., including postage.

CONTENTS.



GLENCARNOCK REVOLUTION (imp. CANADA) (31939).

[Stationed at Trangie Experiment Farm.]

The "Trangie" Aberdeen-Angus Stud is founded on the world-famous "BLACKCAP REVOLUTION" (27530-C.A.A. Soc.), blood of "GLENCARNOCK" (Canada).

Full particulars from—

THE UNDER SECRETARY, DEPARTMENT OF AGRICULTURE,
Box 36a, G.P.O., SYDNEY.

VOL. XLIII. PART 3. MARCH 1, 1932.

Agricultural Gazette of New South Wales.

Piroplasmosis or "Tick Fever."

C. L. O'GORMAN, M.R.C.V.S., Chairman, Board of Tick Control.

THIS disease is one of a group of diseases known as piroplasmoses, which are caused by minute parasites in the blood. These parasites, called piroplasmas, are low forms of animal life belonging to the natural order protozoa. Under natural conditions the piroplasmas are transmitted from affected to healthy animals by ticks. Although there are many distinct forms of piroplasmosis widely known and distributed throughout the old and the new world, in Australia the term piroplasmosis is synonymous with tick fever.

History of the Disease in Australia.

The origin of the disease in Australia is shrouded in obscurity. Opinions differ as to whether it was introduced by cattle from Asia or America. It appears to have existed in the Northern Territory of South Australia for some years without, however, attracting any serious attention.

In 1894 alarm was raised in Queensland because of the ravages of a mysterious disease which was threatening the cattle industry of the Gulf country in the northern portion of the State. Notwithstanding the fact that ticks were observed on the cattle, it was not suspected at the time that they were in any way associated with the disease, and, because of a frequently observed symptom, the malady was generally known as "Redwater disease," a name by which it is still sometimes known, though quite unsuitable, as redwater is not a constant symptom, nor is it confined solely to this disease. In the absence of any knowledge of the disease, and consequent lack of control, it spread with such extraordinary rapidity, and seemingly increasing virulence, that by the end of 1895 it had extended right through to the eastern coast.

Eventually, the disease was identified by Mr. Pound as identical with "Texas fever," of America, a disease known to be transmitted by ticks. This finding was confirmed by a commisison sent to America to investigate. Valuable time had been lost, and, despite all efforts to prevent it, the disease extended until ultimately the whole of the coastal district of Queensland and inland to the Great Dividing Range, became involved.

The Cause of Tick Fever.

The piroplasma, which causes tick fever, because of certain morphological characteristics, is known as *Piroplasma bigeminum*. It is a microscopic organism usually found inside the red blood cells. It multiplies very rapidly, and in the process causes a breaking down of the red-blood cells and consequent release of the colouring matter of these cells. When the destruction of red cells is great, part of the colouring matter is passed in the urine, imparting to it the red colour frequently, though not always, occurring in

this disease. The destruction of red blood cells produces a condition of acute anaemia, and when this destruction is in excess of the animal's recuperative powers death occurs; such is the termination of up to 90 per cent. of susceptible adult cattle affected.

As the tick is the agent by which the disease is transmitted, tick fever is an appropriate name for the malady. The transmission of the disease by ticks is not direct from one animal to another, the tick being what is known as a "single host" trick, that is to say, the whole of its parasitic life is on the one animal. It is by the progeny of the female tick which matures on a beast carrying the piroplasma in its blood that the disease is transmitted to other susceptible animals.

There are several varieties of ticks in Australia; fortunately only one, the *Boophilus australis*, popularly known as the Queensland cattle tick, is capable of transmitting the disease. As suggested by its popular appellation, the tick is well known in Queensland. In New South Wales, however, it is confined to a small area in the north-east corner of the State.

Bovines Alone Susceptible to Tick Fever.

Although bovines are the natural hosts of these ticks, nevertheless they become attached and mature on horses and sheep. These animals, however, are not subject to the disease, bovines alone being susceptible, in just the same way that pleuro-pneumonia contagiosa is peculiar to cattle only.

There is a very important difference in the progeny of ticks which have matured on cattle harbouring the tick fever parasite in the blood and the progeny of ticks which have matured on horses, in that the female tick which sucks the blood of affected animals takes in with the blood the disease-producing organism, piroplasma, the latter passing from the female ticks through the eggs to the seed ticks which hatch out. This new generation will inoculate susceptible animals to which they become attached, and are therefore known as disease-producing or pathogenic ticks, whereas the progeny of ticks, pathogenic or otherwise, that mature on animals not subject to the disease, such as horses, are free from infection; in other words, non-pathogenic. They may infest healthy cattle and produce generation after generation, but no tick fever results. Their existence is, nevertheless, a grave danger, apart from losses they may cause from their purely parasitic influence, as it only requires a beast which is a carrier of the disease in the area—and there are many possibilities of this—and for one of the non-pathogenic ticks to mature on it, when a new generation of disease-producing ticks will result.

This loss of pathogenicity in the progeny of ticks which mature on animals not subject to tick fever is a probable explanation of a feature observed during the latter part of the advance of tick fever in Queensland. It was noted that frequently ticks appeared and infested cattle months before any occurrence of tick fever. We have seen that ticks mature on horses, and that the progeny of such ticks are non-pathogenic and do not transmit the disease. There was a continual local movement of horses from

the fringe of the tick fever area to clean country adjoining, and such country would therefore become infested with non-pathogenic ticks from horses much ahead of the pathogenic ticks by the introduction of recovered cattle which would necessarily be delayed.

Symptoms.

The first indication that something is amiss is when the animal isolates itself from the herd and appears uneasy. With milkers, a drop in the milk secretion is generally the first symptom noted. On examination the animal will be found to be fevered, the temperature ranging from 104 deg. to as high as 108 deg. Fahr. It rapidly becomes worse, rumination ceases, respiration is accelerated, there is great weakness, the animal stands with arched back, head poked out, ears drooped; often saliva hangs in strings from the mouth; it moves with difficulty and with a staggering gait; the bowels are costive, with the passing of hard, dark faeces, often coated with mucous, sometimes blood-stained; occasional purging occurs. There is frequent passage of urine, which may be clear, but is generally muddy in appearance. As the disease progresses the urine may become tinged with red, and is frequently dark-red in colour. Weakness becomes intense; there is a sudden drop in temperature to below normal, heralding a fatal termination, and after a varying period of three to four days, or even less, from the onset of symptoms, death supervenes. At any stage of the disease death may occur suddenly, under excitement or exertion.

Calves up to about twelve months old have a great power of resistance to the disease, and may go through an attack without its being noticed. They, together with older recovered animals, acquire a certain amount of immunity, which, however, is only partial and may break down under adverse conditions at any time. Such so-called immune cattle carry the specific organism of the disease, the *piroplasma bigeminum*, in their blood and may remain carriers for life.

The symptoms exhibited are more or less common to many other diseases, and are not of themselves sufficient for a positive diagnosis of tick fever; not even the occurrence of redwater, as that may result from other causes. They are sufficient for a well-founded suspicion in localities where there is a danger of tick fever occurring. The discovery of a tick, or ticks, on a sick or dead beast strengthens the suspicion of tick fever.

It must be remembered that the disease is transmitted by seed ticks and the affected beast dies before the ticks have grown large enough to be discoverable by ordinary examination, and that one tick is sufficient to set up the disease, so that even with the most diligent searching their presence may not be demonstrated. A positive diagnosis can be arrived at by the demonstration of the piroplasmas in the blood by microscopical examination. Therefore, all suspicious cases of sickness should be notified immediately in order that early action may be taken to nip it in the bud should it prove to be tick fever. The necessity for early notification will be referred to later.

On post-mortem examination the most marked lesions are found in the spleen (melt), liver, gall-bladder, and the blood. The spleen is generally greatly enlarged, and, when incised, its substance is found broken down and of the consistency and colour of black currant jam—in some cases, quite liquid. The liver is somewhat enlarged, yellowish, mottled, or may only show congestion. The gall-bladder is distended, with thick, greenish or brownish, granular-looking bile. The inner wall frequently shows pin-point blood spots. The blood is almost always thin and watery. Patches of congestion in varying amounts are present along the intestinal tract. The carcase shows the general appearance of anaemia, such as gelatinous exudation in various parts, together with a paleness of the muscular tissue.

It is at the post-mortem that the most reliable smears of blood and lymph glands can be obtained for diagnostic purposes. Smears taken from the living animal often fail to show the piroplasma, whilst specimens taken after death readily prove to be positive. The smears should be secured immediately or as soon after death as possible, otherwise, through rapid disintegration, they may not be discernible. Do not wait for the animal to die, therefore, before reporting, as it may result in the post-mortem being delayed until it is too late for reliable smears to be obtained.

Treatment.

No medicinal or other curative remedies have so far proved satisfactory. From time to time very extravagant claims have been made for many remedies, but it cannot be said that any of these have done more than nature, aided by careful nursing, would have accomplished.

It is in the field of preventive treatment that the most effective work may be done. In countries where the disease has been long established, and the cattle have become immune (having been raised in an infested area, and contracting the disease when very young, at which time they have a strong resistance to its effects, the immunity is maintained by continuous tick-infestation), the problem is one of either preventing tick fever by freeing the country of ticks, or of simply protecting, by artificial inoculation, susceptible cattle introduced from uninfected districts, and enduring the many great drawbacks entailed by the presence of such a disease, apart from the heavy losses which the cattle industry suffers from the purely parasitic effects of the ticks.

Country that is free of ticks can be protected against the introduction of tick fever by controlling the movement of cattle from infested regions. No cattle should be admitted until they have been treated in such a manner to ensure that they have been freed of all ticks. It is true that such cattle would be carriers of the disease. The procedure is, nevertheless, a perfectly safe one, the disease not being contagious, and, under natural conditions, transmitted only by ticks. In a tick-free area, therefore, carriers are harmless. Under no circumstances should carriers of the disease be permitted in country infested with ticks, which, though not pathogenic, are capable of becoming so. The soundness for such a prohibition will be appreciated from

the fact, previously given, namely, that non-pathogenic ticks which mature on a beast carrying the piroplasmas in the blood produce pathogenic progeny.

Reference has been made to the non-pathogenic ticks which preceded the occurrence of tick fever in Queensland. It was this advance guard, as it were, of non-pathogenic ticks that invaded New South Wales before effective protective measures were enforced. As soon as they were discovered, the border was closed, and, no cattle being allowed to cross, the ticks remained non-pathogenic. Their progress was checked, however, before they had penetrated very far. It is the descendants of these ticks that are at the present time menacing the cattle industry in the quarantine areas of the north-eastern corner of New South Wales.

A Triumph in Disease Prevention.

It is some thirty years ago since New South Wales took up the defence against tick fever, and, notwithstanding the fact that Queensland cattle infested with pathogenic ticks graze right up to the border, and that thousands of cattle are brought into New South Wales (not the quarantined area) annually from the infected area of Queensland, tick fever has been prevented from becoming established in New South Wales. Truly, a triumph in disease prevention!

No small part in the success is due to the protection afforded by the buffer fence on the border. It is only to be expected, with a situation such as exists on the Queensland side of the border, that, despite the most complete defence, some cases of tick fever would occur in New South Wales, not through a breaking down of the protection established, but by agencies beyond human control. It is not surprising, therefore, to find that an outbreak of tick fever, the first recorded in New South Wales, occurred in 1916 close to the Queensland border, and that since then sporadic outbreaks have occurred at intervals of one, two, and three years.

It is now twenty-five years since the Queensland cattle tick, *Boophilus australis,* was discovered in New South Wales, and no doubt its arrival was some time prior to its discovery. How is it, then, seeing that tick fever has occurred in the quarantine areas of New South Wales, where a tick capable of becoming pathogenic exists, that the disease has not become established? The explanation is that the outbreaks are due to the introduction of pathogenic ticks from Queensland. Owing to the high degree of susceptibility possessed by New South Wales cattle the disease becomes manifest immediately, and appropriate action is taken to ensure that none of the pathogenic ticks is allowed to reach maturity and produce a generation of fever-bearing ticks. Promptness of action is essential, and the existence of an organisation, ready and fully equipped for dealing with the situation provides for this.

Report Immediately any Suspicious Sickness.

The importance of immediately notifying any suspicious sickness has already been stressed. The necessity for this will be more fully appreciated from the foregoing.

The outbreaks of the past have all been rapidly and successfully dealt with, and were it not for the presence of the cattle tick (*Boophilus australis*) in New South Wales would never create serious anxiety. The danger which the stock in the quarantine areas are exposed to is not from the beast that dies of tick fever, as, owing to the high degree of susceptibility of the cattle, the disease runs an extremely rapid course and terminates fatally in a few days, long before the pathogenic tick which transmitted the disease has matured, and consequently it perishes with its host, as do also all other immature ticks which may happen to be on the beast.

To what extent the non-pathogenic New South Wales ticks (which may have been attached to the beast prior to its becoming diseased, and mature and fall off before the death of the animal) become dangerous is not definitely known. Whatever it may be, the danger is in proportion to the degree of infestation, and only by the prompt adoption of preventive measures can it be overcome, emphasising again the necessity for urgency in notifying sickness.

The one real, ever-present danger from these outbreaks of tick fever, so long as the cattle tick remains in the quarantine areas, is the possibility of a recovered animal being overlooked and allowed to remain. Occasionally it happens, even amongst highly susceptible cattle, that a beast recovers. Calves under twelve months are particularly liable to do so. Such an animal is a carrier of the disease for the remainder of its life, and is the medium through which the non-pathogenic ticks produce their pathogenic progeny, the ultimate result being a severe outbreak of tick fever which would practically annihilate the herd. Every stock-owner in the quarantine areas has, therefore, to be ever watchful and report without delay any suspicious sickness, not only to safeguard his own interests, but he is in duty bound to do so in the interests of his neighbours and the State.

So far, no such calamity has occurred. Apparently most recovered cases have come under observation, and in due course have been disposed of to the butcher or passed to Queensland. Freedom in the past from such disaster is apt to create a false sense of security, but so long as the cattle tick (*Boophilus australis*) remains in New South Wales the herds in the infested areas are in continual danger of destruction.

Eradicate the tick, and the danger is removed, together with all irksome, but necessary, measures of control. Without the tick in New South Wales the menace of Queensland would not constitute so serious a proposition.

"THE PIG BREEDERS' ANNUAL."

THE *Pig Breeders' Annual* for 1931-32, published by the National Pig Breeders' Association, London, contains as usual a fine collection of authoritative articles on different aspects of the pig-breeding industry. An article by E. J. Shelton, entitled "Agricultural Shows in Australia," adds a touch of local interest to the publication.

Our copy from the publishers.

Composition and Fodder Value of Grass Silage.

J. N. WHITTET, H.D.A., Agrostologist.

GRAZIERS as well as dairy-farmers in Australia are rapidly realising that ensiling surplus pasturage is a valuable method of conserving fodder, particularly as inclement weather conditions do not interfere with the operations to any considerable degree. To cure and store grass hay it is necessary, in order to produce a high quality product, that optimum drying conditions be experienced during the hay-making operations, whereas a few showers of rain falling on green material which is to be ensiled does not unduly reduce the feeding value of the cured silage.

Methods of Storing Silage.

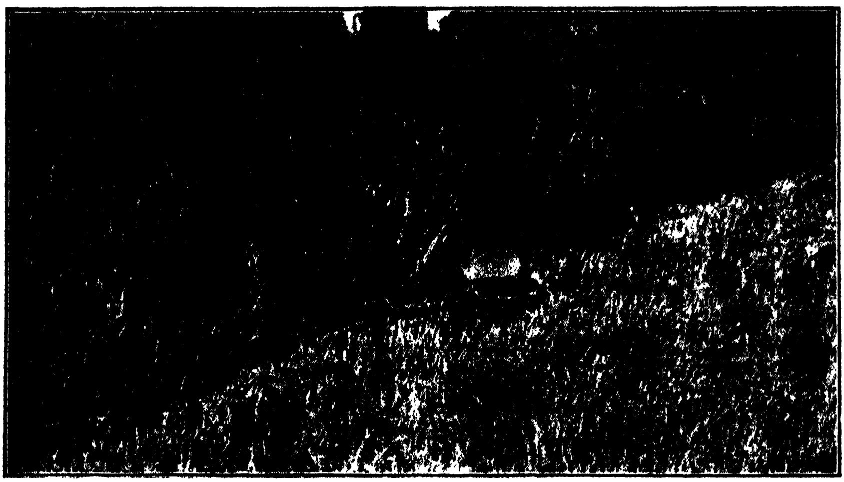
The majority of landholders prefer to store crop silage made from wheat, oats, Sudan grass and similar type material in pit or trench silos because the wastage is less than with stacks; the latter method, however, is particularly useful in locations where the sinking of pits or trenches is made difficult through the intrusion of stony outcrops, or where an impervious substratum exists, or the land is subject to seepage. Although the outer layer of a stack may dry out to some extent this material is not wasted; stock at Wollongbar and Berry Experiment Farms last season cleaned it up readily. In this dry form it resembles a fair-quality grass hay.

Details regarding the methods of ensiling pasturage in stacks, pits, &c., and the special appliances available for economical handling of the material, were published in the December, 1930, issue of the *Gazette*, and reprints are available free on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Analyses of Pasture Silage.

As early as 1908 paspalum (*Paspalum dilatatum*) silage was made at Wollongbar Experiment Farm, Lismore, 140 tons of green pasturage being stored in two stacks. The cured material made excellent quality feed and was readily eaten by milking cows and dry stock, very little waste being experienced. Even at the present time, however, some dairy-farmers in coastal districts incorrectly contend that paspalum is a grass of inferior quality and is not a satisfactory plant to store either as hay or silage. In order to obtain some data regarding its nutritive value when stored as silage, chemical analyses were recently made of silage from typical South Coast paspalum pastures, and compared with an analysis of maize silage from the same district. The analyses were made in September last, the material having been ensiled the previous autumn.

No. 1 grass silage, and also the maize silage, were obtained from the Nowra district and No. 2 grass silage from Berry Experiment Farm. Both grass samples consisted principally of *Paspalum dilatatum*, but No. 1 was cut at what appears from the result of the analysis to be a very satisfactory stage for economical feeding of this species, viz., when the grass has made rapid and luxuriant growth with the seed heads just formed but not reached the flowering stage. No. 2 grass silage was made from areas which required to be cleaned up and contained much material that was well advanced in maturity; the seed was fully developed and a percentage of dead flag was present. Even under these conditions the analysis indicated that No. 2 grass silage would provide a maintenance ration and illustrated the dual advantage to be derived from clearing such material off the paddocks, viz., (*a*) encouraging a better quality growth of short succulent pasturage and (*b*) converting the rank growth of grass, which would make an inferior type of hay, into a useful silage.



Pasture at a Suitable Stage at which to Cut for Silage.

The maize silage was well made and contained an average proportion of grain; the crop was grown on a farm adjoining that on which No. 1 grass silage was produced. The types of soil were somewhat similar, although the maize land was heavier in texture with the clay subsoil closer to the surface. Both soils are described locally as second-class alluvial. The estimated yield of maize (variety Hickory King) was 20 tons, and the grass (No. 1) 6 tons green material per acre. The maize was manured with equal parts of superphosphate and blood and bone, the mixture being applied with the seed at the rate of 1½ cwt. per acre. During 1930 the No. 1 grass paddock received 2 cwt. superphosphate per acre in the autumn. It was heavily

stocked during 1930 and closed up for silage towards the end of the summer season.

No. 2 grass silage was made from an unmanured paddock of third-class alluvial land.

The analyses were as follows:—

ANALYSES of Maize Silage and Grass Silage.

	No. 1 Grass Silage.	Maize Silage.	No. 2 Grass Silage.
	Per cent.	Per cent.	Per cent.
Water	73·36	78·51	65·55
Crude protein	2·92	1·29	2·14
Ether extract	1·00	·51	·57
Crude fibre	8·15	7·08	12·77
Ash	2·95	1·03	3·49
Nitrogen-free extract	11·62	11·58	15·48
	100·00	100·00	100·00
Albumenoid ratio	1 : 4·8	1 : 9·9	1 : 7·4

Calculated on a dry matter basis the percentage compositions were as follows:—

DRY Matter Percentages.

	No. 1 Grass Silage.	Maize Silage.	No. 2 Grass Silage.
	Per cent.	Per cent.	Per cent.
Crude protein	10·96	6·00	6·21
Ether extract	3·75	2·38	1·66
Crude fibre	30·59	32·94	37·06
Ash	11·08	4·79	10·12
Nitrogen-free extract	43·62	53·89	44·95
	100·00	100·00	100·00

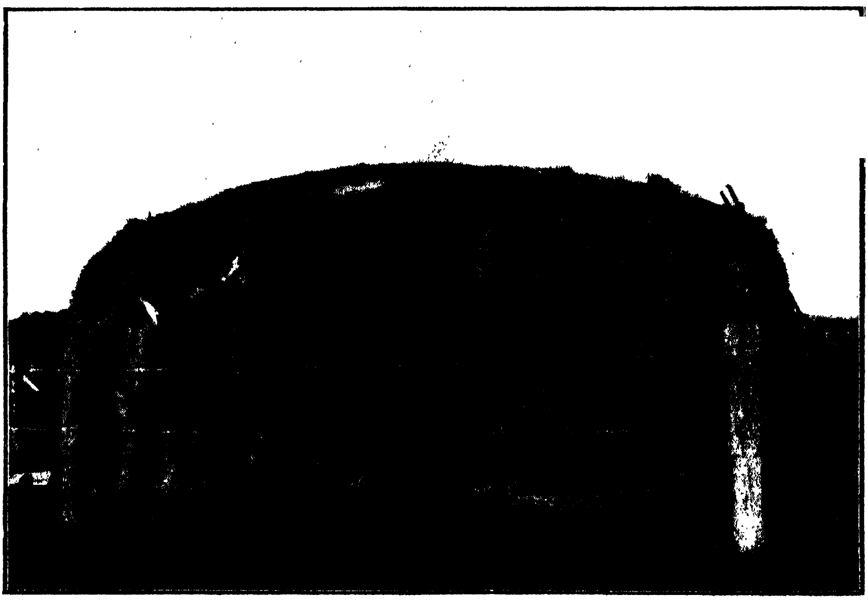
Commenting on these results, the Chief Chemist of the Department considered that the composition of the maize silage very closely approximated the mean figures previously obtained in this and other countries for this class of silage. Mr. Ramsay also pointed out that the protein content of paspalum varies considerably and that paspalum silage could be of very high or very low value, depending on the quality of the grass used. This quality would largely depend on the stage of growth and also on the locality.

hay stage and containing only 0.27 per cent. lime and 0.25 per cent. phosphoric acid would, in that country, be considered as being seriously deficient in these all important mineral constituents of animal food.

The foregoing figures have a definite bearing on the fact that to make good quality silage for feeding to milking cows, attention must be given to increasing the food value of the pasturage by the judicious application of suitable fertilisers and lime.

General Observations.

An exceedingly valuable result of the making of silage from pasturage is the increased digestibility of the crude fibre of the material ensiled.



A Well-made Stack of Grass Silage.

The loss in weight of green pasturage ensiled in a tub silo approximates 12 per cent., and in the case of well-made stack 20 per cent. Similar material containing 75 per cent. of moisture and made into hay would diminish approximately 70 per cent. in weight.

A reduction in the percentage of true protein, phosphorus and nitrogen-free extractives present in the original grass takes place during the fermentation processes of silage-making; the other constituents, however, are not materially changed.

On the average the dry matter of immature pasturage consisting of leafy growth contains double the quantity of protein, lime and phosphorus of pasturage cut when the grasses are well in flower.

The protein, lime and phosphorus of milk are derived from the pasturage consumed by the animal, and a high-yielding cow will more readily maintain her production if the dry matter is readily digestible. In the case of immature leafy pasturage, chemical analyses show that 80 per cent. of the dry matter is digestible, whereas only 40 to 50 per cent. is digestible in grass growth that is in seed.

A dry cow does not require as much digestible nutrients as a cow in milk, and will maintain her condition on feed of lesser quality. Consequently pasturage that has been allowed to grow rank should not be wasted; it can be utilised to advantage by converting it into silage for the use of the dry stock.

If pasturage is harvested in a *very* immature stage of growth it is likely to turn out a wet, mushy silage, which although it may be high in nutrients, would be wastful in feeding as it would provide too narrow a ration and require a more bulky fodder to be fed with it to balance the ration. This work would mean added labour costs, whereas material cut at the right stage of growth means economy of labour and feeding.

A fact that is most important for farmers to realise in intensive pasture management is that one of the chief advantages gained from cutting surplus growth, particularly if it is too tall to be satisfactorily grazed by stock (as is frequently the case with *Paspalum dilatatum* in a good season) is that the condition of the pasture after cutting is improved, because the winter grasses and clovers are given an opportunity to become well established and persist in the sward, thus providing a good balance of succulent feed throughout the year. This mixture of good pasturage, if correctly handled, fertilised and conserved, will make a high quality silage.

WEIGHT OF WHEATEN STRAW AFTER STRIPPING FOR GRAIN.

OWING to the attention given at times to the utilisation of wheaten straw, records have been made at Wagga Experiment Farm to ascertain the weights of straw per acre after stripping.

Reporting on the last harvest, Mr. K. G. Carn, Experimentalist, mentions that only those varieties sown between the May and June rains yielded straw in sufficient quantities to cover cost of harvesting. The following are the weights of straw obtained after stripping with the combined harvester. Had a reaper-thresher or header been used the weights in some cases would have been only about half those shown, depending on the height and state of the crop.

Zealand yielded 18 cwt. 1 qr., Exquisite 15 cwt. 1 qr., Gresley 14 cwt. 3 qr., Baringa 13 cwt. 1 qr., Bobin 11 cwt. 2 qr., Turvey 11 cwt. 1 qr., Yandilla King 10 cwt. 3 qr., Aussie 10 cwt. 3 qr., Nabawa 9 cwt. 3 qr., Federation 9 cwt. 2 qr., Marshall's No. 3 9 cwt. 1 qr., Union 8 cwt. 2 qr.

These weights are representative of good average district crops, except in the case of Yandilla King and Marshall's No. 3, which were affected somewhat by water-logging and foot-rot.

TUBERCLE-FREE HERDS.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date.
Mittagong Farm Homes	46	3 Mar., 1932
George Rose, Aylmerton	4	4 „ 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 „ 1932
P. M. Burtenshaw, Killean, Inverell	50	5 „ 1932
Miss Brennan, Arankamp, Bowral	10	6 „ 1932
Koyong School, Moss Vale	4	12 „ 1932
G. A. Parish, Jerseyland, Berry	123	13 „ 1932
Lunacy Department, Parramatta Mental Hospital	33	16 „ 1932
Cowra Experiment Farm	32	24 „ 1932
Hawkesbury Agricultural College (Jerseys)	115	25 „ 1932
Rydalmere Mental Hospital	73	25 „ 1932
Riverina Welfare Farm, Yanco	77	25 „ 1932
Russell Lamrock, Orange	4	26 „ 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 „ 1932
St. John's Boys Orphanage, Goulburn	9	26 „ 1932
Marion Hill Convent of Mercy, Goulburn	9	26 „ 1932
Department of Education, Yanco Agricultural High School	33	26 „ 1932
Lunacy Department, Kenmore Mental Hospital	79	27 „ 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 „ 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 „ 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 „ 1932
James Wilkins, Jerseyville, Muswellbrook	39	28 „ 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 „ 1932
Tudor House School, Moss Vale	8	3 May, 1932
Australian Missionary College, Cooranbong	53	6 „ 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 „ 1932
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Grafton Experiment Farm (Ayrshires)	193	4 „ 1932
Hurlstone Agricultural High School, Glenfield	53	9 „ 1932
P. Ubrihien, Corridgeree, Bega	133	3 July, 1932
St. John's College, Woodlawn, Lismore	32	11 „ 1932
Gladesville Mental Hospital	40	14 „ 1932
William Thompson Masonic School, Baulkham Hills	45	16 „ 1932
W. Hammond, Bellingen	68	16 „ 1932
W. R. Boughton, Holbrook	22	27 „ 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	31	28 „ 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	13 Aug., 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	14 „ 1932
A. L. Logue, Thornbro, Muswellbrook	41	14 „ 1932
E. E. Winder, Wybong Road, Muswellbrook	46	14 „ 1932
A. Shaw, Barrington (Milking Shorthorns)	100	20 „ 1932
A. H. Webb, Quarry-road, Ryde	4	24 „ 1932
E. E. McMullen, Springbrook, Holbrook	32	25 „ 1932
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 „ 1932
Sacred Heart Convent, Bowral	10	26 „ 1932
Department of Education, Gosford Farm Homes	38	2 Sept., 1932
James McCormack, Tumut	98	9 „ 1932
Wagga Experiment Farm (Jerseys)	64	16 „ 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 „ 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 „ 1932
St. Patrick's College, Goulburn	7	21 „ 1932
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 „ 1932
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 Nov., 1932
Wolaroi College, Orange	11	19 „ 1932
Lunacy Department, Callan Park Mental Hospital	31	20 „ 1932
Berry Experiment Farm	129	26 „ 1932
J. L. W. Barton, Wallerawang	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood	8	3 „ 1932
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 „ 1932
Lunacy Department, Morisset Mental Hospital	27	7 „ 1932
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 „ 1932
Newington State Hospital and Home	100	17 „ 1932
W. T. Herbert, Racecourse Farm, Bega	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega	78	8 „ 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 „ 1933
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys)	80	22 „ 1933
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 „ 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 „ 1933
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
New England Girls' Grammar School, Armidale	29	3 „ 1933
Lidcombe State Hospital and Home	149	3 „ 1933
G. L. Genge, "Easton," Armidale	33	4 „ 1933

—MAX HENRY, Chief Veterinary Surgeon.

Wheat and Oat Trials, 1931.

FARMERS' EXPERIMENT PLOTS.

South-Western District.

D. V. DUNLOP, H.D.A., Agricultural Instructor.

ALTHOUGH the past season was the most favourable experienced since wheat-growing became general in this district, it was not without anxiety for the wheat farmer. Crops sown during April made excellent growth, and were not checked at any stage. Late crops, however, made poor growth, and failures were only averted by a favourable early summer.

Rainfall registrations at the different centres are given in the following table, while a more detailed comment on the season is given in the author's report on the district crop-growing competitions (see page 207 of this issue) :—

RAINFALL Registrations.

Month.	West Wyalong (S. J. Edgerton).	Ungarie (D. N. Johns).	Kikoira (E. Douglas).	Weja (G. C. Wallace).	Lake Cargelligo (S. P. Circutt).	Weethalle (F. E. Schmidt).	Enrawatha (C. E. Burdett).	Merriwagga (E. S. Hazeldine).	Goolgowi (J. Deegan).	Barellan (H. J. Manning).	Moombooldool (P. Corcoran).	Ariah Park (G. G. Ballantine).	Quandialla (A. L. Harnett).	Berendebba (P. Coelli).	Tullibigeal (H. J. Harley).
1930.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
July	Not available.	104	111	181	142	87	...	...	...	107	124	119	179	...	138
August		125	110	110	61	128	172	149	130	187	228	259	161	201	121
September ...		19	29	20	31	39	33	31	53	54	50	52	50	39	21
October		312	279	382	349	267	330	271	387	326	336	350	435	409	270
November ...		65	151	93	110	128	118	96	100	159	102	127	59	84	28
December ...		370	312	418	346	147	45	363	498	300	380	289	169	160	516
1931.															
January		119	50	42	48	54	60	0	0	63	73	65	157	90	0
February ...		4	25	0	7	37	0	21	28	44	52	9	0	9	28
March		430	277	291	307	302	171	199	260	261	397	512	283	331	127
Total on Fallow	...	1,548	1,344	1,437	1,401	1,189	929	1,130	1,465	1,501	1,742	1,782	1,493	1,323	1,249
1931.															
April	177	160	154	182	198	132	144	164	197	139	212	281	272	269	182
May	482	516	624	595	514	500	523	276	389	512	558	769	517	520	454
June	412	414	834	381	293	348	397	341	455	365	481	589	446	395	326
July	76	95	93	111	104	104	70	80	79	83	113	95	137	123	72
August	58	72	66	49	37	54	24	22	47	37	50	77	67	46	46
September ...	71	131	129	141	91	112	79	110	53	88	128	94	153	111	119
October	30	37	35	50	36	36	30	60	77	50	29	67	37	21	37
Total on Growing Crop ...	1,306	1,425	1,435	1,509	1,273	1,286	1,267	1,053	1,297	1,274	1,571	1,972	1,629	1,485	1,236

Disease was exceptionally rare, foot rot and take-all being the most common. Only odd crops were seriously damaged by flag smut, although it was present in all susceptible varieties. Late frosts did some damage, but this was not extensive.

Wheat Variety Trials.

Late-maturing varieties did better than usual when sown early, due to the favourable season. Early and mid-season varieties, however, maintained their superiority at most centres.

CULTURAL Details and Yields of Wheat Variety Trials.

District ...	Euratha.	Merriwagga.	Merriwagga.	Budawong.	Goolgowi.	Tabbita.	Barellan.	Colinroobie.	Moombooldool.	Ariah Park.	Ariah Park.	Berendebba
Experimenter ...	C. E. Burdett.	E. S. Hazeldine.	T. H. Emery.	L. Moore.	J. Deegan.	R. E. Brumby.	H. J. Manning.	A. H. Jennings.	P. Corcoran.	G. G. Ballantine.	D. W. Edis.	P. Coelli.
Nature of soil ...	Mallee ...	Light loam	Mallee ...	Medium red loam.	Mallee ..	Light loam	Medium heavy loam	Medium heavy loam.	Mallee ...	Heavy clay loam.	Medium loam.	Clay loam
Ploughing ...	Scarified August.	Disc-ploughed August.	Disc-ploughed August.	Mouldboard December, 1929, and again October, 1930.	Disc-ploughed August.	Scarified April.	Mouldboard July.	Mouldboard June.	Mouldboard July.	Skim-ploughed June.	Mouldboard July.	Mouldboard 3 inches August.
Cultivation ...	Harrowed April.	Combined November.	Combined December, combined April.	Spring-toothed March, spring-toothed April.	Harrowed January, combined April, harrowed April.	Combined May, combined October, combined April.	Spring-toothed September, spring-toothed October, spring-toothed April.	Disced September, disced March, scarified April.	Spring-toothed October, scarified February, scarified April.	Spring-toothed September, harrowed November, scarified April.	Spring-toothed September, scarified January, combined March, April, and May.	Scarified October and February, spring-toothed March.
Date of sowing	2 May.	25 April.	22 April.	24 April.	23 April.	26 April.	3 May.	21 May.	4 May.	28 April.	3 June.	3 May.
Seed per acre	45 lb.	45 lb.	45 lb.	45 lb.	48 lb.	45 lb.	60lb.	60 lb.	45 lb.	60 lb.	65 lb.	58 lb.
Superphosphate per acre	56 ..	56 ,,	56 ,,	56 ..	56 ..	56 ,,	84 ,,	84 ..	112 ,,	84 ,,	84 ..	84 ,,
After-treatment	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks ...	First crop.	...	First crop.	First crop	...	...	...	†	†	...	...	‡
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Currawa ...	18 0	...	26 8	...	...	...	...	...	20 2	...	...	...
Nabawa ...	15 0	30 55	38 0	...	28 0	...	37 30	10 5	24 45	...	25 15	24 32
Exquisite ...	15 10	...	...	...	...	29 10	...	...	18 30	31 36	...	24 14
Penny	16 40	...	29 10	...	...	30 0	...	16 20	...	...	...	24 27
Rajah	17 30	30 23	...	30 47	...	...	32 30	...	...	...	...	...
Turvey	14 20	...	...	...	...	...	...	...	...	...	...	...
Yandilla King...	14 40	...	26 58	...	...	29 10	...	12 40	...	30 37	...	31 43
Waratah	14 0	19 20	...	*24 11	26 20	...	31 40	...	16 10	...	28 15	...
Geeralying ...	...	22 49	...	...	28 56	...	34 15	...	...	...	...	...
Canberra	...	21 27	...	...	25 20	...	...	...	...	...	...	...
Bobin	...	26 6	...	...	32 10	...	36 30	...	30 20	...	28 34	...
Duri	...	17 37	...	...	26 25	...	...	...	...	...	...	...
Ford	...	...	26 58	...	...	30 50	...	17 45	25 0	32 57	...	32 5
Baroota Wonder	...	...	...	22 3	...	...	...	...	...	...	...	...
Riverina	...	...	...	28 0	...	...	...	...	...	...	...	...
Aussie	...	...	...	27 0	...	...	...	...	...	...	29 21	...
Sepoy	...	...	...	...	30 5	...	...	...	17 0	...	...	...
Gallipoli ...	...	...	...	...	...	30 20	...	18 30	18 9	32 1	28 15	32 5
Bald Early ...	...	...	...	...	...	...	30 5	...	...	...	...	...
Baringa	...	...	...	...	...	...	...	16 40	...	30 54	...	12 40
Ranee	...	...	...	...	...	...	...	10 27	...	...	...	...
Bena	...	...	...	...	...	30 0	...	...	...	28 21	...	...
Duchess	...	...	...	...	...	...	...	...	...	32 26	...	30 0
Marshall's No. 3	...	...	...	...	...	...	...	...	...	...	...	30 0
Union	...	...	...	...	...	...	...	...	...	...	...	17 24
Dundee	...	...	...	...	...	...	...	...	...	...	27 56	...

* Waratah frost damaged. † All varieties affected by flood waters. ‡ Baringa and Union damaged by flood; other varieties also slightly affected.

CULTURAL Details and Yields of Wheat Variety Trials—*continued.*

District	Blowclear, West Wyalong.	Ungarie.	Ungarie.	Kikoira.	Weja.	Tullibigeal.	Burgooney.	Lake Cargelligo.	Lake Cargelligo.	Weethalle.	Euratha.	Quandialla.
Experimenter ...	S. J. Edgerton.	J. McMahon	D. N. Johns.	E. Douglas.	G. A. Wallace.	H. J. Harley.	Franklin and Cooke.	G. P. Circuitt.	T. W. Turner.	F. E. Schmidt.	J. R. Somers.	R. Penfold.
Nature of soil ...	Medium heavy loam.	Medium red loam.	Heavy brown loam.	Medium red loam.	Medium brown loam.	Medium heavy loam.	Light red loam.	Deep light loam.	Medium heavy loam.	Medium red loam.	Mallee ...	Heavy self-mulching clay.
Ploughing ...	Scarified, 3½ inches, July.	Mouldboard ploughed July.	Disc-ploughed, 3 inches July.	Scarified, 3½ inches, July.	Scarified June.	Mouldboard ploughed July.	Mouldboard June.	Mouldboard July.	Disc-ploughed July.	Disc-ploughed July.	Scarified August.	Mouldboard August.
Cultivation ...	Spring-toothd October, scarified February, scarified May.	Spring-toothed November, spring-toothed January.	Spring-toothed August, spring-toothed October, scarified March, scarified April.	Scarified November, scarified April, harrowed April.	Scarified August, combined January, disced April.	Scarified August, scarified October, spring-toothed January, spring-toothed March.	Combined October, scarified February, scarified March, combined April.	Spring-toothed October, spring-toothed November, spring-toothed, April.	Spring-toothed November, spring-toothed April, spring-toothed May.	Combined October, combined April.	Disc-ploughed September, spring-toothed October, spring-toothed April.	Spring-toothed February.
Date of sowing ...	6 May.	13 April.	14 April.	1 May.	19 April.	17 April.	10 May.	12 May.	21 May.	27 April.	7 May.	4 August.
Seed per acre ...	55 lb.	53 lb.	50 lb.	45 lb.	48 lb.	56 lb.	45 lb.	55 lb.	50 lb.	50 lb.	45 lb.	60 lb.
Superphosphate per acre ...	56 „	84 „	84 „	56 „	56 „	56 „	56 „	56 „	56 „	56 „	56 „	56 „
After-treatment ..	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks ...	...	*	...	...	...	‡	...	...	...	...	...	Sown too late
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie ...	25 2	...	...	...	29 58	...	...	23 46	...	24 7	...	...
Rajah ...	28 30	15 41	...	...	37 1	...	30 9	...	28 6	...	...	...
Duri ...	31 22	5 25	...	...	...	...	...	23 11	...	25 51	19 20	10 57
Waratah ...	26 50	9 12	...	24 28	29 47	21 13	§19 32	23 5	17 18	21 54	...	11 5
Riverina ...	27 38	...	...	30 55	...	...	...	...	...	...	...	...
Bobin ...	32 19	12 24	...	30 37	...	38 26	34 44	24 11	21 0	29 53	21 47	11 55
Bald Early ...	24 16	13 54	...	31 56	31 11	...	...	22 47	...	...	...	...
Yandilla King ...	...	...	33 37	...	...	...	...	...	...	...	...	...
Exquisite ...	...	...	30 10	...	...	...	...	...	...	...	...	...
Ford ...	...	...	33 37	34 40	...	...	...	...	...	23 38	...	...
Baringa ...	...	...	31 13	...	...	...	...	...	...	...	...	...
Federation ...	...	...	28 26	29 45	...	34 0	...	17 21	21 8	...	...	...
Nabawa ...	...	18 30	...	32 14	...	31 28	...	...	25 45	23 18	18 48	6 13
Gresley ...	...	...	...	27 0	...	...	...	...	...	...	18 30	...
Gluyas Early ...	...	13 0	...	...	...	...	26 29	...	...	...	...	...
Canberra ...	...	...	...	...	27 26	...	22 25	...	...	...	...	...
Gallipoli ...	...	...	...	...	31 23	38 31	...	...	...	...	...	...
Gullen ...	...	...	...	...	†19 9	5 0	...	...	...	19 12	...	10 55
Geeraiying ...	...	...	...	...	...	31 32	...	...	...	...	17 29	...
Sepoy ...	...	...	...	...	...	37 8	...	...	...	...	...	...
Baroota Wonder...	...	...	...	...	...	...	...	...	...	...	15 10	...
Union ...	...	...	...	...	...	...	...	...	...	...	...	11 2
Ranee ...	...	...	...	...	...	...	...	...	27 0	...	...	...

* All varieties affected by frost, particularly Duri and Waratah. † Gullen damaged by frost. ‡ Waratah and Gullen damaged by frost. § Waratah damaged by frost.

Bobin again yielded well wherever tried, but Nabawa was not as outstanding as in former years. This variety is not suited to wet conditions. The yields are given in the table on pages 176 and 177.

Oat Variety and Fertiliser Trials.

The season was particularly suitable for oats, and the yields were very high. At Quandialla, Palestine lodged badly, but otherwise all plots stood up well.

CULTURAL Details and Yields of Oat Variety Trials.

District	Quandialla.	Burgooney.	Moombooldool.
Experimenter	A. L. Harnett.	Franklin and Cooke.	C. Joyner.
Nature of soil	Self-mulching clay.	As for wheat variety trial.	Mallee
Ploughing	Mouldboard, 3½ inches, July.		Mouldboard in July
Cultivation	Rigid tined September, November, and April.		Springtoothed October and March.
Date of sowing	4 May.	21 April.	25 April.
Seed per acre	60 lb.	35 lb.	45 lb.
Superphosphate per acre	60 „	40 „	40 „
After-treatment	......	......	......
Remarks	Palestine lodged badly and yield much reduced.	......	......
Varieties.	bus. lb.	bus. lb.	bus. lb.
Mulga	62 18	48 26	......
Algerian	59 24	......	......
Guyra	60 26	......	45 20
Belar	67 8	......	40 0
Gidgee	68 2	......	45 20
Palestine	53 12	51 9	......
Laggan	......	46 14	39 8
Buddah	......	41 6	42 0
Sunrise	......	......	40 25

Mr. A. L. Harnett, of Quandialla, conducted a fertiliser trial with Mulga oats. The no-manure (check) plot yielded 63 bus. 29 lb., as compared with 62 bus. 18 lb. from the plot that received 60 lb. superphosphate per acre, and 64 bus. 2 lb. from the plot to which 84 lb. superphosphate was applied.

Wheat Rate of Seeding Trials.

The favourable season favoured the heavier applications of seed, as heavy dense crops were able to mature a good sample of grain without displaying the usual tendency to "hay-off."

YIELDS of Wheat Rate of Seeding Trials.

Seed per acre.	Kikoira (E. Douglas—Bobin variety).	Burgooney (Franklin and Cooke—Canberra variety).	Euratha (J. R. Somers—Nabawa variety).	Merriwagga (T. H. Emery—Penny variety).	Ariah Park (D. W. Edis—Gallipoli variety).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
30 lb.	32 47	23 21	17 10	25 31	...
45 „	30 37	22 25	18 48	29 10	28 6
60 „	31 36	20 54	18 24	35 17	28 6
75 „	...	...	...	...	28 15

Wheat Fertiliser Trials.

The yields in these trials indicate little advantage from heavy applications of superphosphate, the favourable season enabling unmanured and lightly-manured plots to germinate well and make rapid growth. In the drier areas of the district the indications are that it is more important to sow early, even without superphosphate, than to sow late with a heavy application.

Basic superphosphate was tried on mallee soil at Euratha, but the yield was lower than obtained from superphosphate.

YIELDS of Wheat Manurial Trials.

	Superphosphate per acre.								No Manure.	
	112 lb.		84 lb.		56 lb.		28 lb.			
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Lake Cargelligo (G. P. Circutt—Federation)	...		18	38	17	21	11	52	...	
Lake Cargelligo (T. W. Turner—Waratah)	17	0	17	8	17	18	...		...	
Burgooney (Franklin & Cooke—Waratah)	18	36	19	39	19	32	18	17	...	
Tullibigeal (H. J. Harley—Waratah) ...	22	56*	21	48*	21	13*	30	42	31	0
Weja (G. A. Wallace—Canberra) ...	...		28	55	27	26	26	26	...	
Kikoira (E. Douglas—Federation) ...	...		30	51	29	45	27	37	24	24
Ungarie (D. N. Johns—Yandilla King)...	35	22	33	37	33	41	...		...	
Ungarie (J. McMahon—Gluyas Early) ...	11	43	13	0	12	22	...		...	
Weethalle (F. E. Schmidt—Waratah) ...	23	5	22	47	21	54	...		19	2
Euratha (J. R. Somers—Gresley)	Basic super. 17	45	19	12	18	30	...		14	50
Euratha (C. E. Burdett—Currawa) ...	...		16	58	18	0	17	50	...	
Merriwagga (E. S. Hazeldine—Waratah)	20	23	19	20	19	20	20	34	16	45
Merriwagga (T. H. Emery—Yandilla King)	30	50	30	50	26	58	...		15	25†
Budawong (L. Moore—Waratah) ...	...		26	2	24	11	21	2	...	
Tabbita (R. E. Brumby—Yandilla King)	...		30	0	29	10	28	40	...	
Barellan (H. J. Manning—Waratah) ...	32	6	31	40	31	40	...		...	
Colinroobie (A. H. Jennings—Yandilla King)	...		12	40	10	45	11	25	...	
Moombooldool (P. Corcoran—Currawa)...	20	2	19	6	19	0	...		...	
Ariah Park (G. G. Ballantine—Yandilla King)	...		30	37	29	57	...		25	56
Ariah Park (D. W. Edis—Waratah) ...	28	6	28	15	27	37	...		...	
Quandialla (R. Penfold—Duri)	12	20	12	20	10	57	...		...	
Berendebba (P. Coelli—Yandilla King)...	33	0	31	43	29	0	...		...	

* Damaged by a late frost. The other two plots on this farm escaped because of their slower maturity.
† Considerably damaged by rabbits.

Wheat Cultivation Experiment.

This trial was carried out on a medium, heavy loam on Mr. H. J. Harley's farm, at Tullibigeal, and although one year's results cannot be regarded as conclusive, they clearly indicate the importance of a spring working, even in a good year. Nabawa was the variety used, and it was sown on 16th April, using 60 lb. seed and 84 lb. superphosphate per acre.

YIELDS in Cultivation Experiment.

	Cultivation Details.	Yield.	
		bus.	lb.
Plot 1 ...	Scarified March and July: springtoothed October, February, and March.	39	18
Plot 2 ...	Scarified March; mouldboard ploughed July; springtoothed October, February, and March.	34	40
Plot 3 ...	Ploughed July; springtoothed October, February, and March	35	32
Plot 4 ...	Ploughed July; springtoothed February and March	33	26

Central-western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

The Season.

ALTHOUGH in some respects the season was abnormal, the yields of grain were very good. Conditions were favourable for early fallow preparation, and spring rains permitted the first cultivations to be done satisfactorily. October rain was above normal, and during the 1930 harvest further rain fell, which induced early weed growth. The disc cultivator was necessary in January to destroy this weed growth, and February, being very dry, made it possible to keep the fallows clean with sheep.

Rainfall in March was heavy, causing considerable erosion of undulating lands. With satisfactory weather in April, sowing commenced under excellent conditions, and continued up to the end of the first week in May, when heavy rain set in. From 4 to 7½ inches were recorded for the month, while in June, although not so heavy, the rain was practically continuous. It was with extreme difficulty that sowing took place owing to the short periods between rainfall disturbances and the puddled nature of the soil. Sowings were made during July and as late as early August; but there was a marked difference in every way between crops sown and germinated prior to 6th May and those sown later. Late winter and spring conditions were satisfactory for growth, and the early-sown crops stooled densely and grew well. In mid-November rain fell which filled the grain of the early crops excellently, and greatly benefited the short late crops. At maturity the early-sown crops were very dense, tall, and well headed with well-filled grain, but, unfortunately, heavy rain fell at this stage and caused considerable lodging and substantial loss of weight in the grain due to bleaching. These crops, however, gave excellent yields of from ten to fourteen bags. This rain was of benefit to the late crops which filled remarkably well, and considering the conditions under which they were sown, yielded exceptionally well.

RAINFALL Table.

	Greenethorpe (A. N. Freebairn).	Billimari (F. W. Harding).	Mogongong (W. F. Griffin).	Eugowra (F. and J. Mulligan).	Wynnefield (F. L. Corke).	Iandra (L. E. Smith).	Grenfell (H. Nealon).	Lockwood (S. E. Nash).	Cowra (W. A. O'Neill).	Tyagong (FreudensteinBros.).	Wattamondara (Walker Bros.).	Billimari (G. A. Gray).	Lockwood (H. H. McDonald).	Pinecliffe (G. Bradley & Son).	Tyagong (Barr Bros.).	Wattamondara (C. Pengilly).	Toogong (K. J. Balcombe).	Tyagong (Joyce Bros.).	Greenethorpe (G. Davidson).	Avenal (Davis Bros.).
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Fallowing Period.																				
1930.																				
August	172	234	178	156	219	220	267	245	181	236	161	224	264	226	170	170	235	170	202	260
September	110	43	94	32	45	101	72	55	57	110	101	41	53	22	100	68	13	100	113	48
October	407	517	394	356	444	393	427	396	492	435	390	491	480	416	407	400	357	361	441	408
November	153	185	108	189	188	117	160	134	211	134	197	148	129	104	105	197	188	99	162	128
December	184	172	137	343	228	150	213	359	197	168	193	256	329	308	124	221	331	150	179	379
1931.																				
January	162	240	243	73	275	100	243	194	208	190	107	199	183	64	186	118	179	144	167	206
February	91	41	133	37	40	25	133	33	35	32	142	30	10	156	22	140	76	54	91	43
March	315	434	737	360	456	384	617	302	501	372	216	397	311	382	373	220	261	364	426	325
Total	1,594	1,866	2,024	1,846	1,895	1,490	2,132	2,018	1,882	1,677	1,507	1,786	1,759	1,678	1,487	1,534	1,640	1,442	1,781	1,797
Growing Period.																				
1931.																				
April	226	222	330	276	255	384	331	437	287	357	271	190	301	285	393	269	194	328	183	462
May	602	451	789	557	621	647	789	398	659	774	645	467	452	418	637	650	385	666	714	437
June	408	370	264	310	436	430	656	328	489	534	440	333	404	440	428	422	300	471	491	422
July	141	208	277	161	163	211	277	156	193	218	146	172	134	137	181	145	123	184	172	198
August	122	180	131	78	112	162	131	95	120	143	110	94	43	61	140	104	73	80	122	84
September	187	162	167	171	157	168	167	189	163	51	171	156	84	166	153	169	197	131	214	198
October	114	127	99	98	116	111	90	95	91	122	147	109	75	49	40	131	105	77	154	124
November	212	133	243	30	144	183	248	188	161	224	120	117	143	224	149	...	180	180	230	154
Total ...	2,012	1,853	2,300	1,681	2,004	2,296	2,689	1,886	2,163	2,423	2,050	1,638	1,636	1,780	2,121	1,890	1,557	2,117	2,280	2,079

The worst diseases were take-all and foot-rot, which were apparently favoured by the wet conditions. In some localities flag smut, and, in susceptible varieties, flying smut were more prominent than for some years past.

Frost damaged quite a few of the early crops, in some cases damaging the whole ear, but chiefly affecting only odd grains on the ear.

The rainfall given in the following table does not include the falls of 3 to 4 inches on 3rd and 4th December, which, as stated above, adversely affected the quality of the grain.

Wheat Variety Trials.

There are several factors which must be taken into consideration when observing the behaviour of varieties in the accompanying table. The rain set-in in May at the height of the sowing season and between the sowing of plots, and it would be unfair to compare varieties which germinated prior to the rain with those sown under wet conditions later, or with varieties on undulating country where soil erosion was bad and did not affect all varieties alike, or where sowing was made unreasonably late, or where take-all was prevalent.

In considering the table, therefore, the yields obtained on the properties of Messrs. A. N. Freebairn, F. W. Harding, F. Milligan, C. Pengilly, F. L. Corke, Freudenstein Brothers, G. A. Gray, Jas. Carter, G. Bradley and Son, and Davis Brothers, may be regarded as reliable comparisons. After Riverina and Bobin were sown on Mr. A. Pengilley's farm heavy rain intervened, and consequently those two varieties can be compared only with each other, the other varieties being comparable with Waratah. Severe soil erosion and guttering occurred on the farms of Messrs. W. F. Griffin, H. Nealon, and Wm. Burns, and the yields obtained were very light, and not strictly comparable. Walker Brothers' plots were sown very unseasonably, and the yields were light, and, although they afford a comparison under these conditions, the comparison is not of much value. The rather low-lying land at Bowan Park, which was badly and unevenly flooded, gave low yields, and the yields were only in a measure comparable. Take-all was very bad across one end of the plots which were otherwise very good at H. H. McDonald's, and may reflect the comparative resistance of the varieties to the disease.

The different dates of sowing by Messrs. C. Pengilly and G. Bradley and Son refer to the sowing of the varieties in their correct season, Ford being included in an early and mid-season sowing at the former.

The season favoured the late varieties, and Yandilla King and Penny were the most successful. Carinda is worthy of further trial; it yielded better than Turvey in the Pinecliff district, where the latter is grown in

preference to Yandilla King. Canimbla was again satisfactory, particularly at Billimari. The quality of grain of this variety is invariably high, and it does not bleach badly.

There has long been a demand for a mid-season variety, and with the failure of such varieties as Bena and Union to resist disease, Nabawa has become very popular as a midseason-early variety. Unfortunately, this variety failed in comparison with others this season, and can definitely be said to be a dry-weather wheat. Two varieties of outstanding merit in this class are Ford and Dundee, the former maintaining the high standard attained under totally different conditions in the previous two seasons. The chief features of this variety are, apart from its ability to yield, disease-resistance, excellent quality of grain and high colour which is not seriously affected by rain when mature. Its chief defect is its length of straw, but this is offset by its toughness, which permits it, when lodged, to be picked up by the false combs practically without loss. Dundee has been tried for two seasons, and is beyond doubt capable of heavy yields, and is of better straw than Ford. The limiting factor in this variety will be its susceptibility to rust. Still another wheat of considerable merit in this class is Baringa, which, although it showed a high percentage of flying smut this season, may be expected to be prominent in future trials.

Considering the wet season the yields of early varieties were remarkably good, and Waratah, Duri and Bobin were outstanding. Although only tried at two centres, where comparisons were fair, Riverina also did remarkably well. Rajah was quite satisfactory, but again lost considerable weight due to bleaching. Geeralying stooled badly, and did not yield as well under wet conditions as in the previous two seasons. Nabawa was sown in nine cases at the same time as the above varieties, and, it will be noticed, yielded very badly in comparison. Where the sowings were made late, Waratah was decidedly the best, and this variety lost none of its popularity this season. Of the very new varieties Gular appears to have merit, while Girral withstood the very wet conditions at Quandong better than any other variety.

Wheat Fertiliser Trials.

In the fertiliser trials it will be noted that the heavier quantities of superphosphate did not give payable results this season. It would appear that the season is the determining factor in the quantity of superphosphate to apply, as the results from year to year are seldom consistent. Whereas last season 84 lb. was invariably the best, lesser quantities were more economical this season. As farmers were forced to reduce the quantity of superphosphate this season in an effort to economise, it was evidently sound practice, but it would not be wise to assume that small quantities are, therefore, the most economical. On the light red loam typical of most of the wheat-growing section of the central west, it will be found that a more or less uniform quantity of from 65 to 70 lb. of superphosphate will prove best over a period.

The results of the trial with mixed fertilisers on stubble ground to ascertain the effect of nitrogen was slightly in favour of M17 fertiliser mixture.

CULTURAL Details and Yields of Wheat

District	Greenethorpe.	Billimari.	Eugowra.	Wattamondara.	Wynnefield, Cowra.	Tyagong, Grenfell.	Billimari.	Grenfell.
Experimenter ...	A. N. Freebairn, "Brundah."	F. W. Harding, "Redlands."	F. Mulligan, "Woodlands."	C. Pengilly, "Ivanhoe."	F. L. B. Corke, "Yurilla."	Freudenstein Bros., "Chippendale."	G. A. Gray, "Glen Ingle."	Jas. Carter, "Kikiamah."
Nature of soil ...	Medium-light red loam.	Light red loam.	Light red loam.	Light red loam.	Medium red loam.	Medium red loam.	Medium-light red loam.	Light red loam.
Ploughing ...	Mouldboard, 4 inches, August.	Mouldboard, 4 inches, end September.	Disced July-August, 3 inches.	Mouldboard, 4 inches, August.	Mouldboard, 4 inches, August.	Mouldboard July, 3½ inches.	Mouldboard August, 4 inches.	Mouldboard August, 4 inches.
Cultivation ...	Spring-toothed November, February, and April, drill sown and harrowed.	Disc-cultivated January, spring-toothed March, combine sown and harrowed.	Spring-toothed September, disc-cultivated January, spring-toothed March and April, combine sown.	Spring-toothed and light harrowed October, November, December, and March, combine sown.	Disc-cultivated October and January, spring-toothed May, and drill sown.	Scarified October and January, harrowed February, scarified March and June, drill sown.	Disc-cultivated January, spring-toothed February and March, combine sown.	Harrowed September, disc-cultivated January, scarified April, drill sown and harrowed.
Date of sowing ...	20 April.	25th April.	2 and 4 May.	14 April, 1 and 21 May.	6 and 7 May.	4 and 5 June.	4 May.	27 April.
Seed per acre ...	68 lb.	62 lb.	60 lb.	56, 65, 70 lb.	60 lb.	52 lb.	60 lb.	62 lb.
Superphosphate per acre ...	70 lb.	68 lb.	67 lb.	75 lb.	58 lb.	75 lb.	70 lb.	60 lb.
After treatment...	Nil.	Nil.	Nil.	Nil	Nil.	Nil.	Nil.	Nil.
Remarks ...	—	Flag and loose smut present.	Sowing late for Sepoy.	—	Nabawa stooled very badly	Sepoy sown too late, but late rains benefited.	Yandilla King germinated poorly	Flag smut in Duchess and Canimbla.
Late Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Yandilla King* ...	36 19	...	...	33 2	...	...	20 13	18 27
Cadia	34 48	...	...	...	...	...	...	...
Penny	38 20	...	...	33 38	...	...	...	21 38
Turvey	...	...	...	...	...	...	23 23	...
Carinda	...	...	...	...	...	...	22 32	...
Exquisite ...	...	...	...	...	...	...	...	...
Wandilla ...	35 19	...	...	...	...	...	...	...
Sepoy	...	...	26 5	...	...	29 40	...	...
Canimbla ...	...	...	...	29 30	...	...	27 2	19 30
Marshall's No. 3...	...	...	...	...	...	...	...	19 17
Burrill	...	...	...	...	...	...	...	...
Lawson	...	...	...	...	...	...	...	...
Mid-season Varieties								
Nabawa* ...	...	30 4	18 48	28 38	25 11	28 4	—	18 25
Ford	38 58	40 6	24 6	†34 4 ‡31 33	—	—	31 23	25 50
Dundee	...	—	24 39	...	...	...	31 37	—
Baringa	...	34 12	26 12	...	...	...	...	...
Bena	39 40	33 20	...	...	...	...	...	...
Duchess	...	38 11	...	...	...	...	...	24 28
Bredbo	...	32 0	...	...	...	...	...	...
Union	...	...	...	...	...	...	...	...
S.H.J.	...	...	17 33	...	...	...	...	...
Early Varieties.								
Waratah* ...	...	—	25 32	26 14	37 56	31 37	—	—
Duri	...	...	...	30 40	35 45	29 32	—	...
Bobin	—	...	27 56	31 6	...	26 15	...	—
Rajah	...	...	...	26 38	36 47	26 28	...	—
Riverina ...	...	...	...	...	36 57	...	...	...
Geeralying ...	...	...	22 17	...	...	...	...	...
Canberra ...	...	...	...	...	...	25 36	...	...
Aussie	...	...	...	...	...	...	...	...
Gular	...	...	...	...	37 47	...	...	—
Gullen	...	...	...	...	28 6	...	...	...
Girral	...	...	...	...	...	...	...	...
Baroota Wonder	...	...	...	23 40	...	...	...	...
Gresley	...	...	...	—	...	...	...	...

* Standard variety for comparison.

Variety Trials, 1931—Central-west.

Lockwood, Canowindra. H. H. McDonald, "Belmont."	Mogongong, Grenfell W. F. Griffin, "Valicare."	Quandong, Grenfell. H. Nealon, "Currajong"	Wattamondara. Walker Bros., "Pontefract Park."	Forbes-road, Eugowra. A. Pengilly, "Roselea"	Pinecliff, Molong. G Bradley and Son	Cargo. Davis Bros. "Lannecoorie."	Bowan Park Cudal. D. O'Neil "Clear View."	Carcoar. W. Burns, "Goongirwarrie."
Medium red loam.	Grey loam ...	Light red to grey loam.	Light red loam.	Light red loam.	Light red loam.	Medium-light red loam.	Strong red loam.	Grey clay loam.
Disc-ploughed September, 4 inches.	Not ploughed	Mouldboard November, 4½ inches.	Mouldboard September, 4 inches.	Mouldboard November, 4 inches.	Mouldboard August, 4 inches.	Disc-ploughed August, 4 inches.	Mouldboard September, 4½ inches.	Mouldboard February, 4 inches.
Springtoothed November, harrowed early February, springtoothed May, disc drill sown.	Disc-cultivated July, springtoothed September, March, and end May, combine sown.	Harrowed January and February, springtoothed and harrowed March, skim-ploughed prior to drill sowing.	Scarified November, January, April and prior to sowing, combine sown.	Scarified January, March and several times prior to sowing, combine sown.	Disc-cultivated February, springtoothed March combine sown.	Harrowed November, disc cultivated February, springtoothed April, combine sown.	Springtoothed ruary, March, and April, combine sown harrowed.	Harrowed March, combine sown and harrowed
5 and 6 May.	3 June.	3 and 16 June.	18 July.	12 and 19 May.	5 May and 4 June.	5 and 6 May.	20 and 27 May.	1 and 8 April
65 lb.	65 lb.	65 lb.	75 lb.	60 lb.	60 lb.	65 lb.	60 lb.	68 lb
75 lb.	75 lb.	70 lb.	80 lb.	60 lb.	70 lb	50 lb.	60 lb.	75 lb.
Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil
Take-all present on one end all varieties: least in Exquisite.	Badly washed and guttered, and soil set.	Soil erosion bad.	Sown too late	Rained during sowing.	...	...	Area low-lying and stooling thin	Soil washed badly and set hard.
bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
14 35	...	...	...	...	...	...	...	12 10
18 20	...	...	...	...	...	...	...	...
18 41	...	...	...	...	...	...	...	...
17 49	...	...	...	...	21 43	...	...	...
16 55	...	...	...	...	22 47	...	...	...
21 16	...	...	...	...	...	...	...	...
16 5	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	11 30
...	...	...	...	...	...	...	...	...
...	17 18	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	12 4
...	11 13	12 25	11 12	21 2	21 29	21 11	...	9 54
...	16 24	...	...	24 2	...	...	...	14 3
...	...	...	...	...	26 40	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	17 28	...	...	...	...
...	...	...	...	...	...	...	...	...
...	21 12	16 30	12 10	25 1	16 34	31 57	16 10	...
...	...	16 30	12 54	22 51	...	28 52	17 0	...
...	15 30	...	13 43	28 19	17 36	29 59	13 54	...
...	16 45	...	10 9	...	...	26 21	12 58	...
...	...	...	...	30 52	...	...	14 3	...
...	14 40	12 28	...	...	...	20 0	...	...
...	...	...	...	...	...	...	15 23	...
...	18 12	...	...	...	...	...	...	...
...	...	15 25	9 53	...	...	...	...	...
...	...	10 42	...	...	...	...	...	...
...	...	18 10	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	10 49	...	...	...	...	...

† April sowing. ‡ May sowing.

CULTURAL Details and Yields of Wheat Fertiliser Trials, 1931.

District	Iandra, Greenethorpe.	Lockwood, Canowindra.	Greenethorpe.	Quandong, Grenfell.	Grenfell.
Experimenter	L. E. Smith, "Weroona."	S. E. Nash, "Wollombeen."	G. Davidson, "Gambara."	J. T. Hawick, "Alveston."	O. G. Blayney, "Baroola."
Nature of soil	Level red loam..	Medium red loam.	Undulating red loam.	Light red loam..	Level light red loam.
Ploughing	Not ploughed...	Disc-ploughed September.	Mouldboard August.	Mouldboard August.	Not ploughed.
Cultivation	Scarified July, again end October, January, and March, harrowed February, combine sown.	Springtoothed end December, January, and early April, combine sown and harrowed.	Disc cultivated January, springtoothed March, combine sown.	Harrowed October, springtoothed December and twice February, also March, combine sown.	Disc cultivated February, springtoothed end April, and combine sown.
Date of sowing	19 May.	19 May.	5 May.	21 June.	6 May.
Seed per acre	60 lb.	60 lb.	60 lb.	60 lb.	62 lb.
After treatment ...	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks	...	...	...	Sown too late: delayed by wet weather.	Take-all present.
Varieties	Duri	Waratah ...	Nabawa ...	Marshall's No. 3	Nabawa.
Fertiliser (per acre)—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Superphosphate, 30 lb.	3[illegible] 12	...	...	...	...
" 56 "	...	24 18	25 22	7 56	...
" 60 "	32 47	...	...	...	...
" 70 "	...	23 28	...	7 22	15 2
" 80 "	...	...	...	...	14 27
" 84 "	...	...	25 48	8 40	...
" 90 "	34 18	22 28	...	...	...
" 112 "	...	...	25 35	...	...
P11, 65 "	...	...	...	...	15 32
P15, 84 "	...	...	...	..	15 27
M17, 108 "	...	...	...	...	16 58

NOTE.—P11 mixture consists of six parts superphosphate and one part sulphate of ammonia, P15 of three parts superphosphate and one part sulphate of ammonia, and M17 of two parts superphosphate and one part sulphate of ammonia.

Wheat Rate of Seeding Trial.

Messrs. Barr Brothers conducted a rate of seeding trial with Canimbla, which was combine sown on 27th April with 75 lb. superphosphate on a paddock which had been scarified at the end of July and again in March. Although it germinated before the rain, the heavy winter rain had a thinning effect on the crop, the land being a very level uniform light loam.

The yields were as follow:—

Rate of seeding.	Yield.
67 lb.	16 bus. 56 lb.
55 lb.	16 bus. 32 lb.
80 lb.	16 bus. 28 lb.

These results are consistent with a trial with Nabawa last season, and although the differences in yield are again only a matter of pounds, it would appear that heavier quantities of seed are unnecessary and uneconomical.

CULTURAL Details and Yields of Oat Variety Trials, 1931.

District	Eugowra.	Toogong, Cudal.	Cowra.	Grenfell.	Garra, *via* Molong.	Mogongong, Grenfell.	Eugowra.	Cudal.
Experimenter	J. E. Mulligan, "Clarendon."	H. J. Balcomb, "Teecoona."	W. A. O'Neil, "Hillview."	Joyce Bros., "Greendale," Young-road.	E. N. Brooks.	W. F. Griffin, "Valicare."	A. Pengilly, "Roselea," Forbes-road.	D. O'Neil, "Clear View," Bowan Park.
Nature of soil	Light red loam...	Medium red loam	Red clay loam ...	Medium red loam	Light red loam ..	Grey clay loam...	Light red loam...	Low-lying, strong red loam.
Ploughing	Mouldboard July, 4 inches.	Not ploughed ...	Mouldboard February, 4 inches.	Mouldboard October, 4 inches.	Not ploughed ...	Not ploughed ...	Mouldboard November, 4 inches.	Mouldboard September, 4½ ins.
Cultivation	Disced January, springtoothed February, harrowed April, combine sown.	Disc cultivated October, harrowed early January, springtoothed February and April and drill sown.	Harrowed and scarified March, scarified May, drill sown.	Harrowed February, springtoothed May, drill sown and harrowed.	Disc cultivated January, and early April, combine sown.	Disc cultivated July, springtoothed September, March, and prior to sowing, combine sown.	Scarified January March, and April, combine sown.	Springtoothed early February March, and April, combine sown and harrowed.
Date of sowing ...	10 May.	4 April–1 May.	6 May.	22 May.	24 April.	4 June.	21 May.	27 May.
Seed per acre	48 lb.	45 lb.	48 lb.	60 lb.	60 lb.	50 lb.	50 lb.	50 lb.
Superphosphate per acre	60 ,,	56 ,,	56 ,,	60 ,,	70 ,,	60 ,,	60 ,,	60 ,,
After treatment ...	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks	Belar was rather badly frosted.	...	Rust prevalent. Rain during harvest.	...	...	Surface badly set and guttered, due to heavy rain.	Slight rust present.	Low-lying, became waterlogged.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Belar	23 19	39 1	33 28	30 0	21 7	20 14	...	...
Palestine	41 25	...	...	35 30	...	...	40 25	...
Gidgee	32 29	...	31 7	35 0	32 33	...	...	29 22
Mulga	23 20	38 37	29 27	32 0	25 32	24 10	47 26	27 15
Lachlan...	...	40 22	30 7	30 20	26 36	...	...	...
Buddah	...	...	35 2	29 10	22 9	...	34 6	23 12
Myall	...	...	...	34 35	...	...	...	...
Guyra	...	53 30	...	...	...	...	...	...
Algerian	...	47 5	...	...	29 0	...	...	...
Kendall	...	...	...	...	...	35 23	...	...
Sunrise	...	...	...	...	...	...	...	24 0

Oat Variety Trials.

It was not a satisfactory season for oats owing to the wet winter months and a slight rust attack. Harvesting was also hampered by rain, and any crop not harvested before it fell was badly knocked about and considerable grain was lost.

For this reason Belar, which has been very consistent the last few seasons, did not do so well as the earlier varieties. Palestine did remarkably well this season, particularly at Eugowra, while Gidgee gave the highest yield at two centres. Buddah was not very satisfactory and generally was inferior to Mulga, which is still the most favoured early oat in the district.

The late oats were very dense at Cudal, Guyra outyielding all other varieties.

Western District (Parkes Centre).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

The Season.

The winter rains of 1930 were reasonably good, producing a satisfactory soil condition for fallow ploughing. The summer and early autumn rains were opportune and substantial, and the fallow workings resulted in well-conditioned and moist seed beds. The April sowings went in under ideal conditions, there being a quick germination and a vigorous early growth of the young crops. However, frequent and heavy rains commenced on 8th May, and a relatively small area was sown thereafter. The early sowings grew apace until mid-June, and only the wetness of the soil prevented most crops being fed off. During July, most soils were in a water-logged condition, which had the effect of retarding growth, and of producing a yellowing of much flag. From mid-July until the last week in September (ten weeks) relatively dry conditions prevailed, but at the latter date two falls of 40 points each proved most opportune and beneficial. The dry cool spring proved all to the good and the bulky crops were able to mature slowly, there being a minimum of loss of moisture by evaporation. October was dry, there being only two falls of 30 points each, which, however, were of some little service.

The experiment plots at Mandagery were discarded on account of being so seriously damaged by hail, whilst those at Bogan Gate suffered unevenly from water-logging during the early winter, rendering the yields useless for comparative purposes. The plots at Tottenham, Condobolin (M. Westcott) and Ootha were affected by late frosts.

The following table shows the rainfall as recorded at the post offices at a number of centres in this district:—

TABLE Showing Rainfall at Different Centres.

Month.	Parkes Average.	Parkes.	Forbes.	Bogan Gate.	Condobolin.	Tullamore.	Peak Hill.
	points.	points.	points.	points.	points.	points.	points.
Fallow Period—June, 1930, to March, 1931.							
June	237	295	233	279	391	327	257
July	187	219	182	174	93	143	219
August	187	214	210	163	155	262	251
September	170	19	22	13	34	17	11
October	154	379	376	270	154	355	290
November	142	197	216	245	165	248	118
December	190	475	281	367	405	349	506
January	210	126	159	103	190	71	159
February	142	76	55	Nil	Nil	11	36
March	168	392	317	451	254	237	586
Total ...	1,787	2,388	2,051	2,065	1,841	2,020	2,433
Growing Period—April to October, 1931.							
April	146	290	383	211	275	237	361
May	159	446	654	509	527	397	569
June	237	434	348	324	297	365	406
July	187	141	188	177	84	154	240
August	187	55	53	28	49	24	34
September	170	145	199	120	138	111	96
October	154	67	81	50	22	39	80
Total ...	1,240	1,578	1,906	1,419	1,392	1,327	1,786
Grand Total ...	3,027	3,966	3,957	3,484	3,233	3,347	4,219

Behaviour of Varieties under Trial.

The variety trials did not reveal any outstanding performances, but several wheats behaved well enough to focus further attention upon them.

Bobin was again well to the front in yields.

Rajah was also prominent and has produced consistently high yields in these trials during the past five years. It seems to be particularly suited for fairly early sowing in the red loams of the West.

Dundee possesses distinct possibilities; its mid-season maturity, flag smut resistance, reasonably short straw and attractive brown ear making it suitable for April sowing in the west. Its yields, while not the heaviest, have been quite satisfactory.

Ford performed fairly creditably, but its lodging habit detracted somewhat from its performance; it, however, picked up splendidly, and harvested one of the best samples of grain.

CULTURAL Details and Yields of Wheat Variety Trials, 1931.

District ...	Tottenham.	Condobolin.	Ootha.	Trundle.	Peak Hill.	Parkes.	Alectown.	Brolgan.	Tichborne.	Wirrinya.	Albert.	Coradgery.
Experimenter ...	Stanley Bros.	W. Westcott.	A. Heinrich.	J. Maynard.	G. W. Shreeve.	S. J. Plowman.	F. Patton,	F. Nicholls.	B. Tomkins.	K. H. Hastings.	D. J. Radford.	G. Quinn.
Nature of soil ...	Light red loam, 9 inches deep, new land.	Red loam, 15 inches deep, new land.	Red loam, old land.	Red loam, old land.	Red loam, 9 inches deep.	Chocolate clay loam.	Red loam, 9 inches deep.	Heavy red loam, 6 inches deep.	Black clay loam.	Heavy red loam, old land.	Red loam, 12 inches deep.	Heavy loam.
Ploughing ...	Sundercut July, 1930,	Sundercut June, 1930.	Mouldboard August.	Scarified July.	Sundercut September.	Mouldboard July.	Disced August.	Mouldboard October.	Scarified August.	Disced July.	Disced July.	Mouldboard September.
Cultivation ...	Disc cultivated January, combined April.	Spring-toothed September and February, harrowed March.	Harrowed October, combined March.	Combined September, November, February, and April.	Harrowed January, spring-toothed January, sundercut March, combined April.	Worked six times.	Disced January, combined February, March, and April.	Combined February and April.	Disced February, harrowed April, scarified April.	Worked four times.	Combined September and April.	Combined January, February, and May.
Date of sowing ...	10 April.	22 April.	15 April.	23 April.	5 May.	21 May.	30 April.	30 April.	29 April.	22 May.	16 April.	25 May.
Seed per acre ...	50 lb.	47 lb.	46 lb.	50 lb.	45 lb.	60 lb.	59 lb.	55 lb.	54 lb.	60 lb.	54 lb.	62 lb.
Superphosphate per acre ...	37 ,,	50 ,,	55 ,,	70 ,,	Nil.	56 ,,	50 ,,	58 ,,	53 ,,	56 ,,	38 ,,	56 ,,
After treatment ...	...	...	...	...	...	...	...	...	...	...	...	...
Remarks ...	Gullen, Bobin, Waratah, and Riverina frosted.	All plots frosted—yields not comparable	Five plots frosted.	Ford harvested late.	...	...	Geeralying shed 6 bus. per acre.	...	...	...	...	...
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Waratah ...	Frosted.	Frosted.	Frosted.	Frosted.	31 35	24 20	...	...	...	30 50	Frosted.	24 55
Rajah ...	25 15	...	28 7	38 17	...	21 43	...	...	...	33 21	28 20	...
Nabawa ...	22 50	Frosted.	24 6	28 59	28 15	...	...	32 59	...	27 59	27 57	26 26
Riverina ...	Frosted.	Frosted	Frosted.	41 18	31 7	...	22 0	...	...	...	...	...
Gullen ...	Frosted.	Frosted.	...	...	...	27 37	...	...	...	28 40	Frosted.	...
Bobin ...	Frosted.	Frosted.	Frosted.	38 25	37 48	26 34	30 39	...	...	30 47	Frosted.	26 9
Geeralying ...	...	Frosted.	...	...	...	25 6	23 4	...	...	...	...	...
Ranee ...	...	...	Frosted.	...	...	...	...	...	...	...	Frosted.	...
Ford ...	...	...	27 41	28 2	32 15	...	...	...	32 30	28 38	23 31	26 0
Duri ...	...	...	Frosted.	...	...	...	...	...	...	...	...	...
Burrill ...	...	...	...	...	31 26	...	...	...	...	...	...	24 22
Duchess ...	...	...	...	...	...	20 31	...	...		...	...	...
Waugan ...	...	...	...	...	...	21 40	...	...	...	...	...	...
3 G 4 ...	...	...	...	...	...	18 28	...	...	...	...	...	...
Turvey ...	...	...	...	...	...	...	27 0	...	25 57	...	...	...
Bena ...	...	...	...	...	...	...	26 22	33 46	...	...	...	28 18
Federation ...	...	...	...	...	...	...	23 57	35 54	36 21	...	...	...
Union ...	...	...	...	...	...	...	23 55	37 24	36 35	...	...	...
Dundees ...	...	...	...	...	...	...	26 36	34 3	32 7	...	...	...
Free Gallipoli ...	...	...	...	...	...	...	29 52	...	36 34	...	...	...
Bredbo ...	...	...	...	...	...	...	...	33 44	...	...	...	...
Baringa ...	...	...	...	...	...	...	...	33 54	...	...	...	...
Exquisite ...	...	...	...	...	...	...	...	34 40	26 17	...	...	...

Nabawa had rather too much rain during its early growth, and its behaviour in these trials was a little disappointing, though still creditable. This is in direct contrast to its success in the crop competitions, the reasons for which are rather obscure. Nabawa " yellowed " badly during July, and the heavy tall growth lodged readily in early December.

Baringa yielded well at Brolgan and showed the least bleaching damage of all varieties, but its toughness of stripping practically debars it from commercial cropping.

Exquisite has the valuable character of flag smut resistance, but its tallness, weak straw, and long narrow grain, which is inclined to pinch, makes its growth unattractive.

Riverina is yielding sufficiently well to make progress, more particularly in the western localities, and should be quite useful for the later sowing period where a fairly flag smut resistant sort is desired.

Wheat Fertilising Trials at Brolgan.

Mr. J. Venables, " Underwood," Brolgan, carried out a fertiliser trial on red loam soil that had been under oats in 1930. First working was given with the sundercut in February, 1931, after which it was harrowed in March, combined in April, and sown on 6th May, Riverina being the variety used for the trial.

The results were as follows :—

Superphosphate per Acre.	Yield bus.	lb.
45 lb.	30	47
60 ,,	29	40
80 ,,	31	14
100 ,,	34	21

Oat Variety Trials.

The outstanding feature of the oat trials was the high yields from the Alectown plots. Mr. A. P. Unger, of " Strong Hill," Alectown, in harvesting 79 bus. 30 lb., established a record for farmers' experiment plots in this district.

The plots at Mandagery and Gunningbland were destroyed by a severe hailstorm.

Notes on Oat Varieties under Trial.

As has frequently been pointed out in this *Gazette*, variety recommendations for oats are not wholly based upon the grain yields, but rather upon their general usefulness for the wheat areas.

For some years, *Mulga* has held first place, but *Belar* has steadily been gaining headway. Both these varieties may be grown with confidence.

Guyra, a later-maturing, plumper-grained oat, is attracting attention and gives the first grazing a little later than Mulga.

Palestine has for some years now been proving itself a high-yielding grain oat. It is short in the straw, has long heads, and medium plump grain. It is not as useful as Mulga when early grazing is desired.

Algerian sometimes outyields all other varieties, but it lacks consistency and drought resistance.

CULTURAL Details and Yields of Oat Variety Trials, 1931.

District	Albert.	Ootha.	Murrumbogie.	Trundle.	Bogan Gate.	Parkes.	Cookamidgera.	Alectown.
Experimenter ...	D. R. Gray.	C. W. Buckland.	Carr Bros.	H. Bush.	W. J. Dwyer.	H. Ward.	W. H. Tolhurst.	A. P. Unger.
Nature of soil ...	Light red loam.	Red loam.	Red loam.	Red loam.	Red loam.	Light red loam.	Light to sandy loam.	Chocolate clay loam.
Ploughing ...	Sundercut March.	Mouldboard September.	Sundercut April.	Mouldboard August.	Disced August.	Mouldboard August.	Sundercut December.	Mouldboard August.
Cultivation ...	Spring-toothed April.	Spring-toothed December and March.		Worked three times.	Worked four times.	Worked four times.	Worked three times.	Worked four times.
Date of sowing ...	16 May.	18 April.	22 May.	21 May.	1 May.	4 June.	22 May.	6 May.
Seed per acre ...	40 lb.	50 lb.	40 lb.	40 lb.	50 lb.	51 lb.	45 lb.	50 lb.
Superphosphate per acre ...	48 „	30 „	50 „	30 „	56 „	40 „	30 „	60 „
After treatment ...	...	...	Grazed June and July.	...	...	...	...	...
Remarks	Gidgee lightly frosted.	...	Caked surface July.	...	...	...	...	...
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Palestine	37 34	30 36	14 26	...	57 15	21 20	...	76 11
Mulga	28 28	49 19	13 35	26 3	51 4	15 32	38 37	57 15
Gidgee	33 34	...	...	26 35	...	...	...	...
Belar	26 28	60 13	15 0	19 27	35 23	15 42	28 20	58 34
Guyra	36 2	52 13	27 30	...	39 24	19 15	30 28	51 23
Sunrise	...	...	...	19 37	...	...	...	...
Algerian	...	...	...	...	...	25 29	33 17	79 30

Northern District.

MARK H. REYNOLDS, H.D.A. Senior Agricultural Instructor.

Continuing the practice of previous years, trials to determine the most suitable varieties of wheat, the best fertiliser for that crop, the proper time to sow and the best depth at which to cultivate were carried out on farmers' properties at various centres. Oat and barley variety trials were also conducted.

Weather Conditions.

The abundant rainfall from March to July water-logged the soil, only slightly in the case of the self-mulching soils, but severely on the fine-textured light soils. As a consequence many crops were dwarfed. Frosts in July and on a few occasions in October caused some damage, while westerly

RAINFALL Table.

Place.	Grower.	Rainfall on Fallow.								Rainfall during Growing Period.								
		September, 1930.	October.	November.	December.	January 1931.	February.	March.	Total.	April, 1931.	May.	June.	July.	August.	September.	October.	November.	Tota.
		pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
New Mexico ...	A. E Bowman ...	160	353	98	88	98	30	492	1,319	222	443	287	163	62	73	38	...	1,288
New Mexico ...	A. T. Maunder ...	...	...	...	...	...	143	340	483	218	466	361	237	94	87	38	...	1,501
Rushes Creek ...	W. B. Proudfoot	160	353	98	88	98	30	480	1,307	293	336	339	112	111	63	55	...	1,309
Rushes Creek ...	W. Bomen ...	...	...	...	...	...	30	480	510	293	336	339	112	111	63	55	...	1,309
Manilla	W. Bignall ...	...	...	...	...	...	26	360	386	170	217	372	149	101	85	12	...	1,106
Somerton ...	R. D. Walker ...	...	...	...	...	...	...	221	221	205	401	375	176	97	65	32	...	1,351
Bective	R. J. Hooper ...	...	...	...	...	...	...	403	403	312	471	311	109	107	18	32	...	1,360
Oxley	Forge Bros. ...	...	...	...	...	...	...	200	200	297	322	512	208	142	94	24	80	1,679
Calala	G. H. Dunn, jun.	...	...	...	196	195	147	188	726	133	345	478	222	86	105	30	...	1,399
Loomberah ...	G. Tongue ...	...	...	...	...	...	...	...	...	275	358	470	192	140	131	43	200	1,809
Duri	V. Reading ...	...	...	...	...	25	157	348	530	424	347	393	263	124	142	100	...	1,793
Stangers	B. C. Adams ...	...	...	...	...	...	...	...	...	433	212	327	224	151	8	86	90	1,531
Currabubula ...	T. and D. Scott ...	...	...	...	...	146	48	230	424	306	350	431	132	171	53	55	...	1,498
The Gap	L. R. Hartin ...	...	...	...	...	...	...	304	304	294	215	263	141	75	96	25	...	1,109
Quirindi	Smith Pollock ...	June to Dec.			1000.	440	63	235	1,738	261	469	460	281	86	119	55	...	1,731
Warrah Creek ...	R. Winnett ...	...	...	...	...	...	...	400	400	317	526	424	249	88	99	76	164	1,943

CULTURAL Details and Yields of

District	Manilla.	Garthowan.	Werris Creek	Bective.	Quirindi.	Upper Manilla.
Experimenter	A. T. Maunder, New Mexico.	A. N. Barthalomew.	L. R. Hartin, "The Gap."	R. J. Hooper.	Smith Pollock	J. A. Byrnes.
Nature of soil	Red, medium, part self-mulching, from shale.	Red, medium, from shale.	Black, brown heavy, self-mulching, sedimentary.	Red, grey, medium, from shale.	Black, brown, medium self-mulching from basalt.	Brown, deep, medium, sedimentary.
Ploughing	...	Mouldboard, 4 ins., January.	Disced, 3½ ins., February.	Mouldboard, 4 ins., January	...	Disced, 4 ins., December.
Cultivation	Springtoothed, 3 ins. January, March and May, harrowed April.	Harrowed March, springtoothed April and May	Springtoothed March, harrowed April.	Harrowed March.	Stiff-tined six times from June 1930, and harrowed twice.	Springtoothed January and February, harrowed twice.
Date of sowing	20 May.	18 May.	13 to 20 May.	3 to 13 May.	28 April.	28 April.
Seed per acre	52 lb.	60 lb.	50 lb.	60 lb	60 lb.	50 lb.
Superphosphate per acre	Nil	Nil.	Nil.	Nil.	Nil.	Nil.
After treatment	Nil.	Fed-off July ...	Nil.	Nil.	...	Nil.
Remarks	Lightly dwarfed by water-logging, light frost damage. Geeralying shattered 2 bus. per acre.	Frost damaged on lower portion.	All lodged in part except Bruce, and all pinched except Bruce.	Pusa No. 4 damaged by frost.	Frost reduced yield of Pusa No. 4, Florence and Gluyas Early.	Aussie most frost damaged.
Varieties	bus. lb.	bus lb.	bus lb.	bus. lb.	bus. lb.	bus lb
Clarendon	15 0	20 0	...	...	26 30	—
Bruce	24 16	...	21 45	...	...	...
Marshall's No 3	...	...	...	...	...	...
Yandilla King	...	...	...	...	...	...
Waratah	...	...	...	24 0	...	24 0
Geeralying	20 0	20 16	...	...	...	...
Rajah	...	...	..	24 0	...	...
Aussie	...	...	21 20	...	...	18 0
Sepoy	...	...	...	...	...	...
Currawa	...	...	...	...	...	...
Gullen	19 42	21 13	18 45	...	...	...
Nizam	...	...	...	24 0	...	16 0
Barwang	...	...	...	...	...	...
Pusa No. 4	22 16	17 35	15 45	12 0	21 30	...
Lawson	...	...	...	...	...	...
Wandilla	...	...	...	21 0	...	...
Bobin	...	...	15 0	24 0	...	...
Droophead	...	...	...	...	...	25 20
Canumbla	...	...	...	...	...	...
Canberra	...	...	15 30	...	...	...
Ford	...	...	...	28 0	...	21 40
Hard Federation ...	...	...	18 0	...	...	...
Cleveland	...	...	...	...	...	...
Ranee	...	...	...	28 0	...	...
Baringa	...	...	...	...	32 35	...
Gluyas Early	...	...	...	...	27 0	...
Florence	...	...	...	...	22 15	...
Nabawa	...	...	...	...	...	20 20
Carinda	...	...	...	...	...	...

Wheat Variety Trials, 1931.

Somerton. R. D. Walker.	Oxley. Forge Bros.	Duri. V. Reading.	Calala. G. H. Dunn, junior	Warrah Creek. R. Winnett	New Mexico. A. E. Bowman.	Duri. S. & H. Owen.	Currabubula. T. & D. Scott.
Red, medium, from shale.	Red, medium, partly self-mulching, from shale and basalt.	Red, medium, lightly to heavily self-mulching, from basalt.	Red, medium, from shale.	Red, medium, from basalt.	Red, fine to self-mulching, from shale.	Red, medium, from shale.	Red, medium, from shale and basalt.
Disced, 4 ins., March	—	Mouldboard, 4 ins., December.	Mouldboard, 3½ ins., November.	...	Disced, 4 ins., August and, 3 ins., December.	Disced, 4 ins., January.	Mouldboard, 3½ ins., January.
Springtoothed May.	Springtoothed 3 ins., March and April, harrowed March.	Harrowed February, springtoothed March.	Harrowed twice March, springtoothed April.	Springtoothed March.	Harrowed September and March, springtoothed January and March.	Harrowed twice March.	Harrowed and springtoothed March.
21 May.	27 April	8 May.	28 April.	7 April.	30 March.	25 April.	7 April.
50 lb.	48 lb. to 55 lb.	50 lb to 60 lb.	50 lb	53 lb.	46 lb.	50 lb.	45 lb.
Nil.	Nil.	Nil.	Nil	Nil.	Nil.	Nil.	Nil.
Nil.	Nil.	Nil.	Nil.	Fed-off May to July.	Nil.	Nil.	Fed-off lightly
Waratah least affected by water-logging. Rajah most bleached.	—	Lodged on heavy soil, Nabawa mostly. Stem rust reduced Ford the least.	Baringa least damage from water-logging.	Frost damage, especially Barwang and Wandilla.	Caterpillars damaged crops. Stem rust reduced all except Lawson and Canimbla	Cleveland too long-season, and Canada overtall.	Waterlogging reduced yields on the lower portions of all plots.
bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	26 0	...	...	...	...
...	...	...	...	...	16 40	...	...
22 30	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
18 0	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	27 15	...	...	...	...
...	...	...	...	...	16 40	...	29 0
...	...	...	...	...	...	...	...
16 0	...	22 0	...	...	...	...	...
...	22 20	...	...	17 0	...	21 20	...
...	...	...	...	...	...	...	...
...	...	...	21 27	...	16 36	...	16 30
...	23 30	...	...	16 0	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	27 35	...	20 0	20 24	24 0
...	...	...	...	...	...	...	...
—	30 0	28 30	28 11	24 30	...	...	25 45
—	...	...	27 12	...	...	...	...
...	...	...	...	...	14 10	20 0	...
15 20	...	...	...	...	...	...	...
32 35	...	25 45	31 40	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
17 17	25 0	22 30	25 36	18 22	...	...	...
...	...	...	...	...	13 24	19 0	...

winds and heat in October pinched the grain. A week's rain in November, when a small portion of the crop remained to be harvested, caused bleaching and slight shooting of the grain.

Wheat Variety Trials.

In addition to the experimenters mentioned in the following table, Mr. E. J. Hough conducted a wheat variety trial, but it was so dwarfed by water-logging of the soil that it was choked out by wild oats.

Wheat Diseases Not Prevalent.

Stem rust caused practically no serious damage, Ford, Canimbla and Lawson faring best. Flag smut was mildly prevalent, Nabawa being quite free, while some other varieties, including Ford, were only lightly affected. Other diseases were not troublesome.

Wheat Fertiliser Trials.

Details and results of the fertiliser trials carried out at Manilla, Stangers, Calala and Loomberah are given in the following table :—

CULTURAL Details and Yields of Wheat Fertiliser Trials.

District and Experimenter.	Strangers. B. C. Adams.	Calala. G. H. Dunn.	Calala. G. H. Dunn.	Loomberah. W. H. Lye.	Manilla. W. B. Proudfoot, Rushes Creek.
Nature of soil	Grey to black, light to heavy, from shale and basalt.	Same as wheat variety trial.	Same as wheat variety trial.	Red to black, fine to self-mulching, from shale and sedimentary.	Red, grey, fine and medium, from shale.
Ploughing	Mouldboard 4 inches April.	Same as wheat variety trial.	Disced 3 inches January.	....	Mouldboard 4½ inches September and January.
Cultivation	Harrowed and springtoothed April.	Same as wheat variety trials, plus additional springtoothing in May.	Harrowed March, springtoothed May.	Springtoothed 3 inches four times January to May.	Springtoothed April.
Date of sowing and variety.	5th May—Waratah.	14th May—Rajah.	6th June—Florence.	6th June—Aussie.	21st May—Aussie.
Seed per acre ... lb.	60	50	70	60	60
After treatment ...	Fed off bare in June.	Nil.	Nil.	Nil.	Nil.
Remarks	Better drainage on portion of unmanured caused improvement.	....	Dwarfed by waterlogging.	....	Severely dwarfed by waterlogging.
Fertiliser—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
P15—37 lb. per acre ...	29 30	....	....	....	....
P15—68 „ ...	....	....	....	....	13 45
P15—93 „ ...	....	....	21 27	....	....
P15—101 „ ...	....	....	....	....	12 0
P11—32 „ ...	29 30	....	....	....	....
P11—98 „ ...	....	....	....	23 24	....
M17—42 „ ...	26 24	....	....	....	....
M17—126 „ ...	....	....	....	23 52	....
Superphosphate—					
28 lb. per acre ...	30 24	....	....	....	....
45 „ ...	....	28 47	....	....	....
71 „ ...	....	....	20 46	....	....
80 „ ...	....	....	....	21 50	....
No manure	30 24	25 0	21 0	14 0	9 20

NOTE.—P15 fertiliser mixture consists of three parts superphosphate and one part sulphate of ammonia. P11 six parts superphosphate and one part sulphate of ammonia, and M17 two parts superphosphate and one part sulphate of ammonia.

Time to Sow Wheat.

Trials to determine the correct time at which to sow wheat were carried out at Manilla and Quirindi. Particulars and results are given in the following table :—

RESULTS of Time of Sowing Trials.

District and Experimenter.	Manilla, W. Bomen, Baldwin.	Quirindi, M. Greenwood.
Nature of soil	Red, medium, from shale.	Brown, medium, old sedimentary.
Cultivation	Springtoothed 4 inches January, February and April.	Stiff-tined February, March, and when each plot sown.
Variety and seed per acre.	Nabawa—62 lb.	Wandilla—46 lb.
Remarks	Last sown plot most affected by water-logging.	First sown plot most affected by lodging, frost and aphids.
Date of sowing :—	bus. lb.	bus. lb.
11th April	21 21	14 0
1st May	21 0	18 0
21st May	13 25	18 0

Wheat Rate of Seeding Trial.

Messrs. J. Thornton, of Currabubula, and W. Bignall, of Manilla, co-operated with the Department in carrying out wheat rate-of-seeding trials. At Currabubula varying amounts of Currawa wheat were sown on 15th. April, while at Manilla Sepoy was the variety used, sowing taking place during the first week in May. At both centres rain set the surface soil so hard before the plants came up that the stands were reduced.

RESULTS of Rate of Seeding Trial.

Seed per acre.	Currabubula (J. Thornton).	Manilla (W Bignall).
Currawa—	bus. lb.	bus. lb.
33 lb.	13 30	....
48 lb.	19 45	....
64 lb.	18 30	....
Sepoy—		
33 lb.	....	31 0
50 lb.	....	38 0
65 lb.	....	33 26

Cultivation Experiments with Wheat.

This trial was carried out on a grey medium soil of shale derivation on the property of Mr. G. Tongue, at Loomberah. A plot ploughed 6 inches deep and sown 2 inches deep yielded 25 bushels per acre, whilst another plot ploughed to the same depth, but sown 5 inches deep, yielded 23 bushels A yield of 25 bushels was obtained from a plot that was combined 3 inches

and sown at a depth of 2 inches, and 26 inches 40 lb. from another plot that received the same cultivating, but to which 84 lb. superphosphate per acre was applied.

Oat Variety Trial.

An oat variety trial carried out by Mr. J. Thornton, of Currabubula, on a medium grey, sedimentary soil was sown on 15th April, using 40 lb. seed per acre. The land was disced 3½ inches in February and springtoothed in March. All varieties lodged, Laggan being the least affected. The yields were :—Laggan, 49 bus. 30 lb.; Belar, 44 bus.; Gidgee, 43 bus.; Mulga, 29 bus. 30 lb.; Palestine, 24 bus.

Messrs. H. Owen and A. Wiseman also carried out variety trials, but the crop grew too rankly for grain production.

Barley Varieties under Trial.

Messrs. T. and D. Scott, Currabubula, experimented with Trabut and Pryor barleys for grain yields. Cultural details were the same as for the wheat variety trials on their property (see page 195).

Trabut yielded 54 bushels and Pryor 15 bushels per acre. The latter was adversely affected by the weather conditions.

Cultivation of the Christmas Bush (*Ceratopetalum gummiferum.*)

THOSE who sowed seed of Christmas bush in seed beds earlier in the year should now be preparing to transfer the seedlings to 3-inch pots filled with a compost containing equal parts of light soil, leaf mould, well decomposed sifted cow manure about twelve months old, and sharp river sand. When the seedlings are established in the pots and are 3 to 5 inches high, plant them out in their permanent positions in the garden. Light sandy soils charged with humus, medium loamy or heavy clay soils are alike suitable, provided drainage is good.

No pruning or special cultivation is necessary until the profuse flowering stage is reached, when they can be cut back 2 or 3 feet, or one-third of their height immediately after flowering. If the plants are grown for their blooms there is little need for pruning after the blooms are cut. A good dressing of decomposed vegetable matter applied after pruning helps to promote strong and healthy new growth.

Some soils produce light-coloured blooms, and if a richer and deeper colour is desired, half a pound of powdered iron sulphate scratched into the soil around each plant in September is recommended. Shortage of water during October and November will cause the blooms to drop.

For those who have not already sown seed it is pointed out that young plants in 3- and 4-inch pots are procurable from nurserymen. Little success, however, attends the transplanting of seedlings found in the bush, and usually it is only in Christmas bush country that established plants can be lifted and transplanted satisfactorily.

The large-leaved Christmas bush, or coachwood (*Ceratopetalum apetalum*), grows taller and requires more moisture than the more popular species.—E. N. WARD, Curator, Botanic Gardens.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	Messrs. Coppleson and Kelly, Wee Waa.
Bald Early	Manager, Experiment Farm, Trangie.
Baringa	Mr. L. D. Bryant, "Glencoe," Ungarie.
	Mr. H. J. Harley, "Wattle Park," Tullibigeal.
Baroota Wonder	Manager, Experiment Farm, Trangie.
Bobin	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	Mr. E. H. G. Eldershaw, "Kywong," Old Junee.
	Mr. W. E. Ditchfield, "Strathmerton," West Wyalong.
	Mr. D. W. Edis, "Prestonville," Ariah Park.
	Mr. R. Penfold, Quandialla.
	Mr. H. J. Harley, "Kindalin," Dubbo.
	Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. B. J. Robards, "Plain View," Nevertire.
	Mr. H. J. Harley, "Wattle Park," Tullibigeal.
Clarendon	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Cleveland	Manager, Experiment Farm, Bathurst.
	Mr. W. Burns, "Goongirwarrie," Carcoar.
Currawa	Manager, Experiment Farm, Temora.
Duri	Mr. M. Greenwood, Spring Ridge Road, Quirindi.
Ford	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Free Gallipoli	Manager, Experiment Farm. Temora.
Geeralying	Mr. J. Parslow, "Cooya," Balladoran.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
Gluyas Early	Manager, Experiment Farm, Temora.
Gullen	Mr. J. Parslow, "Cooya," Balladoran.
Nabawa	Manager, Experiment Farm, Trangie.
	Messrs. Coppleson and Kelly, Wee Waa.
	Mr. J. Parslow, "Cooya," Balladoran.
	Mr. E. H. G. Eldershaw, "Kywong," Old Junee.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
	Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. B. J. Robards, "Plain View," Nevertire.
	Mr. H. J. Harley, "Wattle Park," Tullibigeal.
	Mr. W. G. Law, "Thistledown," Gilgandra.
	Mr. J. W. Watson, "Morvada," Merriwagga.
	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.

Wheat—continued.

Nizam	... Manager, Experiment Farm, Temora.
Queen Fan ...	... Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Rajah	... Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. W. G. Law, "Thistledown," Gilgandra.
Riverina	... Manager, Experiment Farm, Trangie.
Sepoy	... Manager, Experiment Farm, Temora.
Wandilla	... Mr. W. G. Law, "Thistledown," Gilgandra.
Waratah	... Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	Mr. R. M. Gelling, "Cooinoo," West Wyalong.
	Mr. Smith Pollock, "Glengarry," Quirindi.
	Messrs. Coppleson and Kelly, Wee Waa.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
Yandilla King ...	... Manager, Experiment Farm, Temora.
	Mr. E. H. G. Eldershaw, "Kywong," Old Junee.
	Mr. W. G. Law, "Thistledown," Gilgandra.

Oats—

Algerian	... Mr. S. W. Brien, "Glen Logan," Cowra.
	Mr. C. Bennett, "Theole," Forbes-road, Cowra.
Belar	... Manager, Experiment Farm, Temora.
	Mr. C. Bennett, "Theole," Forbes-road, Cowra.
	Mr. C. W. Buckland, "Kangetong," Ootha.
	Mr. S. W. Brien, "Glen Logan," Cowra.
Gidgee	... Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
Guyra	... Manager, Experiment Farm, Bathurst.
	Messrs. Walker Bros., Wattamondara.
Lachlan	... Manager, Experiment Farm, Temora.
Mulga	... Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
	Mr. C. Bennett, "Theole," Forbes-road, Cowra.
	Mr. C. W. Buckland, "Kangetong," Ootha.
Palestine	... Mr. C. W. Buckland, "Kangetong," Ootha.
Sunrise	... Manager, Experiment Farm, Trangie.
White Tartarian	... Manager, Experiment Farm, Bathurst.

Tomatoes—

Improved Sunnybrook Earliana ...	... Mr. Albert Sorby, Macquarie Fields.

Cucumbers—

Early Fortuna ...	... Mr. W. Parry, Terrigal.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

INFECTIOUS DISEASES REPORTED IN JANUARY.

THE following outbreaks of the more important infectious diseases were reported during the month of January, 1932:—

Anthrax	3
Blackleg	4
Piroplasmosis (tick fever)	1
Pleuro-pneumonia contagiosa	1
Swine fever	Nil.
Contagious pneumonia	Nil.
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Varieties of Oats in New South Wales.

[Continued from page 122.]

ALLAN R. CALLAGHAN, D.Phil., B.Sc. (Oxon), B.Sc.Agr., Assistant Plant Breeder.

IN this series of articles the varieties are described in the order of their relative importance. Algerian, Belar and Mulga were dealt with in last month's issue.

Guyra.

Guyra was fixed in 1913 at Cowra from a cross made by Mr. Pridham between White Ligowo and Algerian. Together with Lachlan, Guyra represents the earliest results of improvement in oats by cross-breeding in New South Wales. The White Ligowo parent, illustrated in Fig. 15, is an oat of the true English type belonging to the species *A. sativa*; it is very late maturing, tillers poorly, and has coarse straw, but bears a dense productive panicle. Guyra possesses the drought resistant qualities of Algerian, but it tillers less profusely, produces plumper grain, and gives a higher yield per panicle.

The early growth of Guyra is semi-erect, the foliage is dark-green and medium wide, the leaf blades are stiff and erect, giving the young plants a very characteristic appearance. The foliage of Guyra is glabrous throughout, and this character offers a ready means of distinguishing in early growth this variety from Gidgee, the leaf margins of which are fringed with hairs. In the matter of stooling, Guyra is better than Gidgee, with a value estimated at 3 (scale 5). Glaucousness masks, to some extent, the purple colouration in the leaf sheaths, but even so, it is very evident, especially around the basal portions of the plant.

The stems of Guyra are tall, coarse and medium-strong to strong. The nodes are smooth, large and prominent. As the plants mature the straw changes to a light purple colour; this is most intense just below the nodes.

The panicle of Guyra is ovoidal. The chief branches are medium-long and leave the rachis at angles of from 45 to 60 deg., and remain rigid. (See Fig. 16.) Although the panicle of Gidgee is of the same general type, it is smaller and more condensed. The rachis in both cases remains very erect to the tip. The contour of Guyra panicles resembles more closely that of Lachlan. It is interesting to note that all three varieties Guyra, Gidgee and Lachlan are of the same breeding; they inherit the erectness of their panicle branches from the White Ligowo parent, the panicle of which is condensed-ovoidal.

The grain of Guyra is plump and of good quality. It is dark-brown, often with a mottled appearance, and the palea (the flat side) is usually darker than the rest of the grain. A strong geniculate awn is borne by the primary grain only of all spikelets. The base of the first grain has a small indefinite scar, accompanied by a very sparse basal hair development. The rachilla

fractures at the base, and is thus retained on the second grain. In morphological characters the grains of Guyra and Gidgee are exceedingly alike; the only sure means of distinguishing grain samples is by germinating some of each; the seedlings with glabrous leaves can then be identified as Guyra.

Fig. 15.—White Ligowo.
This variety crossed with Algerian gave rise to Guyra, Gidgee and Lachlan. Note the condensed-ovoidal panicle and the sharp angles made with rachis by the main branches. These characters are reflected in the panicles of Guyra, Gidgee and Lachlan.

Fig. 16.—Guyra.
A typical ovoidal panicle with erect rachis. The chief branches are medium long, and leave the rachis at angles of from 45 to 60 degrees.

Agronomically Guyra is, at present, the standard mid-season variety for the more favourable districts where its use as a grain oat is well appreciated. Its coarse straw makes it less suitable than Belar or Algerian for hay; even so it has the reputation of weighing well in this regard and of producing

soft palatable chaff. Its attractive plump grain is easily picked up by sheep, and consequently Guyra is favoured as a feed oat. As a grain oat it has an advantage over Lachlan in that it threshes cleanly and is not liable to clog the drill during seeding. Unlike some of the earlier varieties, Guyra holds

Fig. 17.—Panicle of Gidgee.

Note that the panicle of Gidgee is more condensed than that of Guyra in the previous figure. The branches are shorter, and the axial angles more acute.

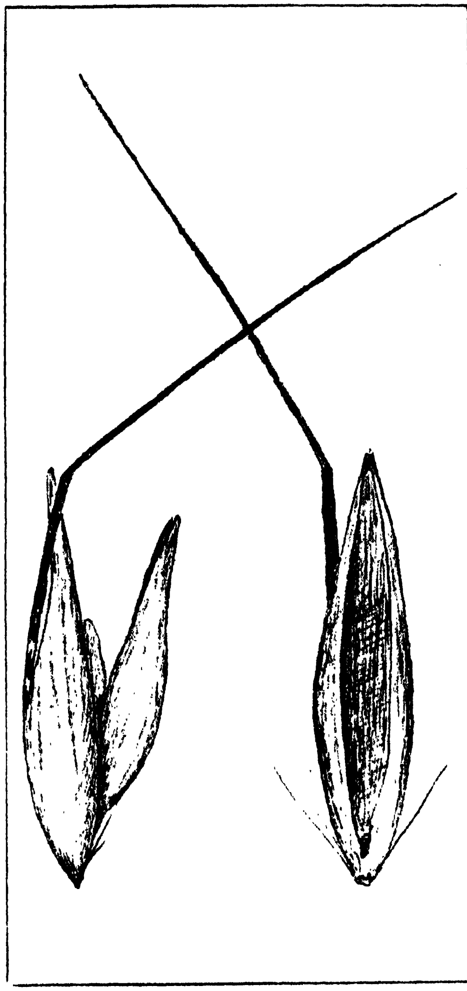


Fig. 18.—Spikelet and Grain of Gidgee.

The primary grain only of the spikelet carries a strong awn; the grain is plump with a very sparse basal hair development, and the rachilla fractures at the base.

The grain of Guyra conforms entirely in these characters and is consequently not figured.

its grain well, and under ordinary circumstances very little is lost through shedding. It is not so well suited to drier areas as Gidgee, maturing as it does some ten days later. Although it fails to produce a large bulk of early feed it recovers fairly well, and is satisfactory for grazing purposes.

Results so far indicate that Guyra is only slightly susceptible to loose smut, but the infection tests as yet are inconclusive. It is highly susceptible to both stem and crown rusts.

Gidgee.

Bred at Cowra by crossing White Ligowo and Algerian, this variety is a sister to Guyra. Although Guyra was fixed as early as 1913, Gidgee was not named until 1921.

The young plants of Gidgee are erect, with medium-broad, but short, stiff foliage. It is a sparse stooler with an index of only 2. The presence of marginal hairs along either side of the base of the leaf blade, and an occasional few on the leaf-sheath, defines the young growth of Gidgee from that of its companion variety Guyra. Gidgee carries much less foliage than Guyra throughout the growing period, the leaves being short and never bulky; this gives the variety an advantage under drier conditions. The leaf-sheaths of Gidgee, like Guyra, are purple through all stages of growth.

The straw is of medium height, medium fine, and fairly strong, standing well under most conditions. A leading feature is its pubescent or, so-called, velvet nodes. The purple colouration typical of Guyra is present on the straw of Gidgee, but to a slightly lesser extent.

The small panicle is of the ovoidal to condensed-ovoidal class. The main branches are short and erect, making angles of from 30 to 45 deg. with the main panicle stalk; the tip of the rachis is very erect. (See Fig. 17.) Although the spikelets are medium-large, and occasionally bear three grains, the usual number of grains per spikelet is two. Under unfavourable conditions, such as a dry spring or when rust is bad, the variety has a decided tendency to produce double grains.

If anything, the grain of Gidgee is shorter than Guyra, otherwise it resembles it closely in plumpness, shape and quality. It is dark-brown and often quite mottled, with a very dark palea. A strong awn is present on the first grain only of all spikelets. The rachilla fractures at the base and the basal scar of the primary grain, though present, is very small, and accompanied by a very few long hairs which are fragile and easily dislodged in handling. (See Fig. 18).

This variety is notable for its earliness and drought resistance, qualities which make it particularly suitable for growth in the drier oat-growing areas of the State. In these districts it has proved its superiority over Mulga for both grain and hay. Its plump grain enhances its value for hand-feeding sheep. As a grazing oat it is considered superior to Mulga both in the amount of early bulk and subsequent recovery after feeding off.

Unfortunately Gidgee is very rust liable, and in a season of rust epidemic suffers heavily. Its early maturity allows it to escape to a large extent under ordinary conditions. It is also susceptible to loose smut and crown rust.

Lachlan.

Lachlan shares with Guyra the distinction of being amongst the first productions evolved by cross-breeding in New South Wales. It, too, was selected at Cowra from the cross White Ligowo by Algerian, and was named in 1913.

Semi-erect in early growth, its stooling potentialities are estimated at 2½ to 3. In this regard it is better than Gidgee, but hardly as good as Guyra. The foliage of Lachlan is glabrous, except for a few hairs at the very base

Fig. 19.—Panicle of Lachlan.
The panicle is of the ovoidal class with an erect rachis.

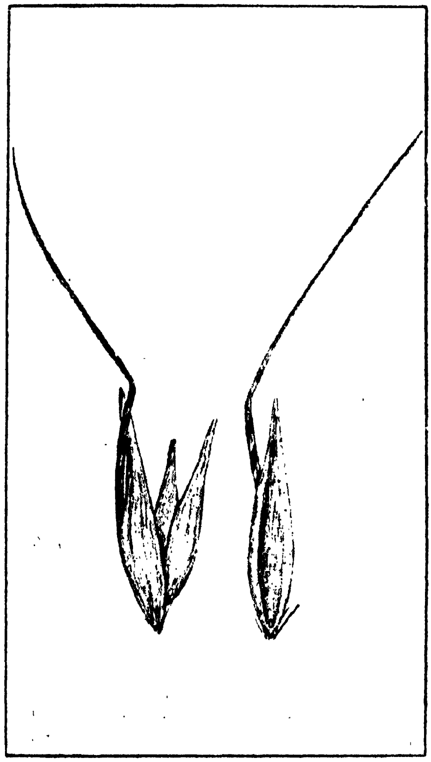


Fig 20.—Spikelet and Grain of Lachlan.
Note the plumpness of the grain, the basal scar, accompanied by a few long hairs, and the short rachilla and its basal fracture.

of the leaf-blade, and the adjoining sheath. It is medium-broad, dark-green, with fairly short erect leaf-blades. Only a slight purple tinge develops on the leaf-sheaths, and this is masked considerably by a glaucousness which gives the sheaths a rather streaked appearance.

Its tall straw is very coarse, rather harsh and medium-strong to strong, with only a slight purple tinge on the lower internodes. The straw of the last internode immediately below the panicle is yellow. Except for a few hairs immediately above and below, the nodes are glabrous.

The ovoidal panicle is very similar in general detail to that of Guyra with erect branches and rachis, but the angles of the main branches with the rachis are slightly more acute, varying from 40 to 50 deg. (See Fig. 19.) The spikelets are large and generally evenly distributed. The outer glumes are longer and the spikelets generally larger than in Guyra. The panicle is readily distinguished from that of Belar, although in grain characters there is some resemblance.

Although the grain is long it is characteristically plump. It is light-brown in colour, with a short rachilla and the grains of the spikelet hold tenaciously together. On the other hand Belar, to which it bears some resemblance, has a longer rachilla and the grains of the spikelet readily fracture apart. A further point of distinction lies in the absence of basal hairs in Belar and the presence of a few long prominent ones in Lachlan. The basal scar of Lachlan is small, and is typical of the intermediate type of base found in oats of part *sterilis* origin. The grain of Lachlan is illustrated in Fig. 20.

Lachlan is of midseason maturity and has enjoyed a certain popularity because of its productiveness and plumpness of grain. One of its chief defects is the tenacious adherence of the grains of each spikelet; this is objectionable, causing the drill to clog, thereby interfering considerably with its proper seeding. Furthermore, its particularly coarse straw lacks the softness of Guyra. Lachlan is steadily losing ground in favour of Guyra, which is more dependable as a dual-purpose variety, equally as productive for grain, and threshes readily.

Although productive, Lachlan is often handicapped seriously by stem rust, to which it is very susceptible. It is also susceptible to loose smut and crown rust.

(*To be continued.*)

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Tumut (Milton Archer) ...	... Mar.	1, 2
Taralga (W. N. Fitzgibbons)	... "	1, 2
Mudgee (T. P. Gallagher) ...	... "	1, 2, 3
Cooma (G. E. Metcalfe) ...	... "	2, 3
Dorrigo (A. C. Newman) ...	... "	2, 3
Braidwood (H. E. Roberts)	... "	2, 3
Yass (S. C. Sleeman) ...	... "	2, 3
Maitland (M. A. Brown) ...	... "	2 to 5
Oberon (F. H. Kelly) ...	... "	3, 4
Moss Vale (H. Richardson)	... "	3, 4, 5
Gundagai (W. J. Sullivan)	... "	8, 9
Moruya (H. P. Jeffery) ...	... "	8, 9
Dungog (W. H. Green) ...	... "	9, 10, 11
Camden (G. V. Sidman) ...	... "	10, 11, 12
Goulburn (T. Higgins) ...	... "	10, 11, 12
Bowral (E. Waine) ...	... "	11, 12
Gunnedah (M. G. Tweedie)	... "	15, 16
Gloucester (M. Newton) ...	... "	16, 17
Muswellbrook (C. R. Sawkins)	... "	16, 17, 18
Crookwell (A. G. McDonald)	... Mar.	17, 18, 19
Sydney Royal (G. C. Somerville) ...	"	21 to 30
Kempsey (E. E. Mitchell)	... April	6, 7, 8
Taree (C. A. Jackson) ...	... "	7, 8, 9
Bowraville (A. H. Newman)	... "	12, 13
Orange (Geo. T. Williams)	... "	12, 13, 14
Wingham (C. H. Blenkin)	... "	13, 14
Wee Waa (P. Cant) ...	... "	13, 14
Grafton (L. C. Lawson) ...	... "	13 to 16
Maclean (T. B. Notley) ...	... "	20, 21
Macksville (P. R. Larkey)...	... "	26, 27
Casino (E. J. Pollock) ...	... "	27, 28, 29
Gresford (A. R. Brown) ...	... "	29, 30
Trangie (F. H. Hayles) ...	... May	10, 11
Cootamundra Sheep Show (G. B. Black)	... July	20, 21
Berrigan (R. Wardrop) ...	... Sept.	28
Narrandera (J. D. Newth)	... Oct.	4, 5
Cootamundra (G. B. Black)	... "	25, 26

Wheat Crop-growing Competitions, 1931.

FURTHER REPORTS FROM THE JUDGES.

South-western District.

D. V. DUNLOP, H.D.A., Agricultural Instructor.

COMPETITIONS were conducted by the agricultural societies at Lake Cargelligo, Hillston, Ungarie, West Wyalong, Ariah Park, Ardlethan, Barellan and Quandialla, and Tullibigeal Agricultural Bureau. The total number of entries judged was 200. Mr. H. H. Andrews, Agricultural Instructor, judged at Hillston and Ardlethan, and Mr. T. P. Taylor, Experimentalist, judged the Quandialla competition.

The Season.

The season was the most favourable experienced since wheat growing became general over the area covered by these competitions. These districts are definitely early, particularly the western sections. April is the main sowing month; thus the great proportion of crop was sown before the extremely heavy rains delayed further work, and crops were growing while later districts had to wait for favourable weather. The result has been a large number of excellent crops, and district averages amongst the highest in the State.

RAINFALL on Fallow and Growing Crop.

Period.	West Wyalong.	Ungarie.	Tullibigeal.	Lake Cargelligo.	Ariah Park.	Ardlethan.	Barellan.	Hillston.	Quandialla.
	points.	points.	points.	points.	points.	points.	points.	points.	points.
Fallow period... ...	...	1,548	1,427	1,589	1,782	1,764	1,501	1,324	1,493
Growing period—									
April, 1931... ...	177	160	182	222	254	186	185	212	272
May, „	562	516	554	620	762	534	551	300	517
June, „	521	414	326	362	550	588	405	368	446
July, „	135	95	72	104	95	110	80	109	137
Aug., „	58	72	46	28	20	101	68	62	67
Sept., „	99	131	119	111	146	120	142	104	153
Oct., „	61	37	37	22	50	67	104	75	37
Total period ...	1,613	1,425	1,336	1,469	1,877	1,706	1,535	1,230	1,629

From the time of fallowing the season was abnormal. Extremely heavy rains were experienced during December, and all fallows were saturated. The months of January, February, and March were fairly dry, and most fallows worked up into excellent condition. Fair rain fell during April, but sowing was not seriously interrupted. May and June, however, were extremely wet, and practically no outside work was possible. Odd crops in

low-lying areas suffered from water-logging, and others were badly washed, but this damage was not extensive. Early crops germinated splendidly and made a good growth. A dry spell occurring during October slightly reduced the yield of some crops in the western sections, and a late frost did a limited amount of damage.

Varieties.

Twenty-four varieties were included in the entries, an increase of two compared with last year. Of the twenty-four, only six were met with more than four times. It is obvious that too many varieties are being grown, and farmers are urged to confine their sowings to tried and proved varieties recommended by the Department.

Nabawa was first favourite with eighty-four entries, followed by Yandilla King with thirty-five and Waratah nineteen and a half. Nabawa is undoubtedly the outstanding wheat for these districts. It did not do so well from a competition point of view this year, however, as it does not stand wet conditions well, and has a tendency to be weak strawed, which is accentuated in a rank crop.

Where they were sown early the year favoured late varieties, Penny and Yandilla King being particularly prominent.

VARIETIES Entered.

Variety.	No. of Times Entered.	Placings.			
		First.	Second.	Third.	Total.
Nabawa	84	1½	3	5	9½
Yandilla King ...	35	2	4	1	7
Waratah	19½	...	1	...	1
Penny	13	3	...	½	3½
Turvey	9½	1	...	...	1
Bobin	7½	½	...	1	1½
Purple Straw ...	4	...	1	...	1
Ranee	4	...	...	...	...
Duri	3	...	...	...	...
Federation ...	3	...	...	1	1
Riverina	2	...	...	...	...
Marshall's No. 3 ...	2	...	...	...	...
German Wonder ...	2	...	...	...	...
Ford	1½	1	...	...	1
Exquisite	1½	...	...	½	½

Gallipoli, Aussie, Jay Wonder, Caliph, X.B., Gullen, Queen Fan, Champion, and Meadowbarbank were entered (once each) but did not gain any award.

Purity and Cleanliness.

Crops generally were clean and free from undergrowth. A common fault was the presence of strangers, although many farmers are making improvements in this direction.

Foot-rot was the only widespread serious disease, the reduction in yield being in some cases considerable. Flag smut was common, but not as a rule in its usual heavy form.

Cultivation.

All crops with the exception of six were sown on fallow. The average number of workings given the fallow was four, a very satisfactory figure for such a large entry.

Rate of Seeding and Fertilising.

The following table shows the average amount of superphosphate applied per acre and the average rate of seeding:—

District.	No. of Entries.	No. Sown without Super-phosphate.	Average Amount of Super-phosphate per acre.	Average Amount of Seed per acre.
			lb.	lb.
Barellan	53	3	55	59
Ungarie	36	3	48	52
Ariah Park	23	...	60	63
Quandialla	19	6	51	57
West Wyalong ...	18	1	46	59
Hillston	17	11	30	49
Tullibigeal	13	8	33	51
Lake Cargelligo ...	11	5	38	54
Ardlethan	10	1	52	58

Although many excellent crops have been grown without superphosphate and also on stubble this season, farmers are reminded that the season was phenomenal, and they are strongly urged to apply at least a little superphosphate in future if at all possible, and also to confine their crops to fallow.

The Temora District.

L. JUDD, H.D.A., Manager, Temora Experiment Farm, and District Instructor, and T. P. TAYLOR, H.D.A., Experimentalist, Temora Farm.

Crop-growing competitions were conducted at the following centres:— Temora, Young, Cootamundra, Burrowa, Murrumburrah, Bribbarree, and Dirnaseer.

The Season.

The season, although it opened well and promised an appreciable change from the three previous ones, proved in the end to be most disappointing, and in the eastern portion of the district yields fell to the lowest level for many years. Rain was experienced in excessive quantities in May, repeated heavy falls resulting in floods, and water-logged conditions prevailing right throughout May and June. As would naturally be expected, only early-sown crops showed to advantage. Late-sown crops were characterised by

lack of stooling, density, vigour, and ability to yield. Rather dry conditions were experienced in August, September, and October. This militated against record yields, but proved a blessing to many crops, which, had a drooping spring been experienced, must have undoubtedly lodged to such an extent as to make their harvesting problematical. The spring conditions spelt the death-knell of the late-sown crops, however, as far as successful yields were concerned.

The Varieties.

Twelve different varieties were entered in the competition, the number of entries of each being as follows:—Yandilla King 21, Nabawa 12, Waratah 12, Marshall's No. 3 8, and Federation, Florence, Bena, Turvey, Bobin, Wandilla, Ford, and Duchess 1 each. Of the above-mentioned varieties, Yandilla King secured four first places in the seven competitions and Nabawa three.

In this district, Yandilla King again demonstrates its suitability to conditions prevailing, and might well replace several other varieties, such as Turvey, Federation, Wandilla, &c., which still find adherents in the district. For several years it has been definitely demonstrated that it is the most suitable late-maturing variety for cultivation in this district. Being a variety which readily responds to good treatment, it can confidently be reserved for the best fallows, and, provided seeding is made to time and average conditions are secured, it can be relied upon to show an excellent return.

Nabawa must find a definite place in cropping routine. Its drought-resistant qualities, coupled with its measure of resistance to flag smut, make it an exceptionally handy variety, particularly where, owing to the farming system and erosion, lay land cropping is resorted to.

Waratah and Marshall's No. 3 still enjoy a measure of popularity in the better favoured areas of the district.

Bobin, although represented with but one entry in the competitions, promises to be a formidable rival to Waratah in the western areas of the district.

Ford also was represented only once, but on its performance is sure to gain favour in the near future.

Seed Treatment.

Dry treatment of the seed was adopted by all competitors with the exception of one entry, and it is interesting to note that in this case, where the old bluestone treatment was used, traces of bunt were found in the crop.

There is room for improvement in the standard of the seed used. Farmers could with benefit to themselves apply a little more care to the selection of their seed, especially with a view to controlling loose smut. An inspection of the seed block at flowering time will show whether this disease is present or not, and farmers would be well advised to sow seed only from crops that are free from it.

Manuring.

The rate of application of superphosphate varied from 30 to 80 lb. This is much lighter than was used last year, when the applications ranged from 56 to 112 lb. per acre. The abundant supply of moisture present in the soil favoured the crops, and good yields were obtained from the lighter applications. One must not lose sight of the fact, however, that in the past most farmers have been in the habit of applying heavy dressings of superphosphate, and the residual value of these applications, together with the abundant rainfall, have played an important part in this season's yields. It is doubtful if such light applications will continue to give good yields in the future, with the return to normal seasons and a natural decrease of the residual effect.

Diseases.

Disease infection was shown in all crops. Flag smut has attained such proportions that in addition to rotation measures and better farming practices thought must be given to the selection of varieties showing a measure of resistance. Foot-rot and take-all were very much in evidence, particularly on paddocks that had been continuously cropped to wheat without rotation. Undoubtedly the greater adoption of oats as a rotation would do much to place operations throughout the district on a better footing.

Cultural Methods.

The value of a good fallowing system seems to be well understood by the majority of the competitors. Early preparation of the fallow (in June for preference) followed by the use of the harrows in the spring, together with springtooth and scarifier workings later for the destruction of weeds and formation of the seed-bed, represents more or less the most satisfactory procedure. In eroded country, naturally, a departure is called for, prevention of loss of soil being of paramount importance.

Mention must be made of the damage which is resulting from erosion in the western portion of the district. Not only were yields materially reduced this year, but harvesting must in some cases be an expensive proposition on account both of increased costs and damage to the harvesting machinery. This matter should receive the earliest attention, and some attempt should be made to prevent further damage to cultivation areas.

North-western District.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

The north-western wheat-growing area was well represented in the crop competitions this season. The area covered by these competitions in this particular section of the district extends from Gunnedah to Inverell, including Wee Waa. From the point of view of excellence of crop and increased number of entries the competitions this season were a marked success.

The Agricultural Societies and Bureau Branches which conducted competitions were:—Moree, Wee Waa, Narrabri, Boggabri, Gunnedah, Bingara, Inverell, Treloar Springs and Myall Creek.

The Season.

Despite the fact that the commencement was unusual, the season turned out satisfactorily. The summer period was similar to that of the three previous seasons—that is, comparatively dry for this district, with rains commencing about March. Particularly good falls were received in that month, which enabled wheat to be sown under good conditions early in April. This month was a good deal drier than March, and large areas of wheat were sown from beginning of April till the middle of May in the early section of the district. Further heavy rains were recorded after the middle of May, which caused considerable difficulty in sowing the remainder of the crop. The sowing period was particularly unfavourable at Inverell, where naturally the season is later and the bulk of the wheat is sown during May and June. Good rains generally were recorded in June and July, and there appeared to be every possibility of another epidemic of rust; but conditions during subsequent months were not congenial for the development of the disease, and despite comparatively dry conditions during these months a successful harvest was gathered.

Frost damage was prevalent as a result of soft growth made by the crops during the mild June and July. Frosts were severe at the end of July and through August. Damage was done at flowering stage also, the early damage being done when the head was still in the shot blade.

RAINFALL at the Different Centres.

1931.	Myall Creek.	Inverell.	Bingara.	Moree.	Wee Waa.	Narrabri.	Palla-mallawa.	Gunnedah.
	points.	points.	points.	points.	points.	points.	points.	points.
Fallow period (January to March). ...	...	811	1,370	981	955	1,030	1,043	559
Growing period —								
April	...	264	360	258	216	242	297	254
May	337	351	496	417	598	490	464	337
June	326	338	467	286	496	554	287	428
July	245	206	149	117	150	80	111	79
August	78	67	61	87	49	72	113	151
September ...	185	176	184	132	28	66	104	53
October	86	89	163	85	40	52	86	46
Total growing period	1,257	1,491	1,880	1,382	1,577	1,556	1,462	1,348
Grand total ...	...	2,302	3,250	2,363	2,532	2,586	2,505	1,907

Cultural Details.

Of the 127 crops entered in the competitions, ten only were grown on winter fallow. This was probably due to an effort to increase the sowings the previous season. It is remarkable that such good crops can be produced in the north-west with a short summer fallow, but farmers would be very unwise not to introduce an occasional winter fallow and give the initial working on the short fallow early. The lesson taught by these competitions is similar to that learnt from previous ones—that the earlier the initial working is given the fallow the greater the honour obtained by the crop.

The average number of times the fallows were worked was remarkably low, but the initial working in the leading crops was given early. The following figures do not include the initial working:—Wee Waa 2.1, Moree 2.1, Narrabri 2, Boggabri 2, Gunnedah 2.2, Treloar Springs 2.1, Bingara 1.8, Myall Creek 2, and Inverell 3.5.

Varieties.

The outstanding varieties were Ford, Nabawa and Waratah. It is interesting to note the increase in popularity of Ford this season (from six entries last season to 32 this year); the variety secured 4½ first places and 4 second places. Nabawa also increased in popularity this season (from 21 to 47 entries), securing 2½ firsts and 3½ seconds and the district championship.

Waratah is gradually giving place to Nabawa and Ford, although this season it did remarkably well. The number of entries fell from thirty-eight to eighteen. Cleveland was entered 1½ times and secured first place at Inverell. Early Bird, Pusa No. 4 and Aussie filled minor places. Florence, Queen Fan, Wandilla, Currawa, Hard Federation, Marshall's No. 3, Duri, Quality and Clarendon were entered, but failed to gain any places.

VARIETIES Used and Their Placings.

Variety.	No. of Entries.	Placings.			
		First.	Second.	Third.	Total.
Ford	32⅚	4½	4	1	9½
Nabawa	47⅔	2½	3½	5⅓	11⅓
Waratah	18	1	1½	⅓	2⅚
Early Bird ...	½	...	...	½	½
Pusa No. 4 ...	3½	...	...	½	½
Cleveland	1½	1	...	...	1
Aussie	3⅙	...	...	⅓	⅓

Seed and Fertiliser.

The average rates of seeding per acre at the various centres were as follows:—Wee Waa 41.8 lb., Moree 50.3 lb., Narrabri 45 lb., Boggabri 50 lb., Gunnedah 49 lb., Treloar Springs 40.4 lb., Bingara 52.6 lb., Myall Creek

48.4 lb., and Inverell 59.5 lb. The lowest rate was 33 lb. per acre and the highest rate 60 lb. per acre. The average rate throughout the district was 48.5 lb. per acre.

It is noticeable again that the use of superphosphate is not an important factor in the production of wheat in the north-west. Not one of the crops entered in the competition was treated with superphosphate. The soils generally in the north-west are well supplied with mineral plant-food and by an occasional winter fallow and the use of fodder crops the humus content can be increased and the yielding capacity of our soils maintained.

Diseases.

Foot-rot was the most prevalent disease this season. It showed up in a late form, and was noticeable in practically every crop. It is evident that the good rains during the winter months fostered this disease. Occasional patches of take-all were noticed also. There was every possibility of much damage being done by rust, but seasonal conditions were not suitable for its widespread development. Susceptible varieties like Canberra and Hard Federation were affected.

There was a remarkable freedom from flag-smut generally in the crops, even in susceptible varieties such as Aussie and Hard Federation. This was evidently due to good rains in March and subsequently. Strangely enough, however, slight traces of the disease were noticeable in Nabawa, especially when the variety was sown on country that had previously carried a heavily infected crop.

Loose smut was noticeable, but the damage from this disease was not appreciable.

General.

These competitions, carried out over a number of years, indicate that provided average rains are received in the winter months in the north-west and summer conditions are normal, the district is capable of producing good crops of wheat on short summer fallow with a comparatively low rate of seeding and without the use of superphosphate. These factors will assist the north-western wheat-grower materially in carrying on his business at a profit.

The Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

Competitions for fifty acres of crop were conducted by the Manilla Farmers and Settlers' Association (twenty-one entries), Tamworth P. and A. Association (seventeen entries), Quirindi P. and A. Association (six entries), and (making its first appearance in the competitions) the Currabubula Farmers and Settlers' Association (seven entries). The Quirindi

Association conducted a 20-acre competition also, obtaining nine entries, and the Junior Farmers' Clubs at Timbumbri and Quirindi each conducted a 2-acre competition, with fifteen and four entries respectively.

Most entries were wholly or partly located on medium to heavy self-mulching red to black soil, which usually carries the best crops, a fact particularly outstanding this year, chiefly on account of the better drainage, which minimised water-logging from the heavy rains in May to July. The land had been cropped for periods ranging from two to sixty years. The usual practice is to devote the land to grazing for a season or two occasionally (say, once in ten years). Long fallowing is less general, the land being mostly summer fallowed from February. In the Tamworth competition particularly the growing of oats occasionally, to rest the land from wheat, starve out certain wheat diseases, and for grazing, is becoming a feature. Three, of the sixteen entries judged, grew oats in 1930 and one was under lucerne, and the wheat crop this year produced well in each. The advantages of a long fallow (from October) were illustrated in two entries in the Manilla competition, one being placed third notwithstanding the handicap of a considerable admixture and wild oats. The other lost through frost damage, Ford wheat, sown 20th March, being reduced in yield from an estimate of 36 bus. to 20 bus.

RAINFALL Table.

District.	April.	May.	June.	July.	August.	September.	October.
	points.	points.	points.	points.	points.	points.	points.
West Manilla ...	117	482	277	133	110	58	8
Quirindi	261	224	314	212	86	97	44
Currabubula ...	306	350	431	132	138	53	55
Bithramere	335	394	468	148	127	114	...
Loomberah	275	358	470	192	140	131	43
Duri	460	453	431	183	80	40	140
Upper Manilla ...	259	448	372	157	116	55	35

Autumn conditions were satisfactory. The winter to the end of July was too wet and the spring on the dry side for some soils, with frosts, a few severe, from mid-July to October. There were occasional hot, dry winds in early November.

Varieties.

The comparative popularity of the different varieties is indicated by the following figures:—Nabawa 22 entries, Waratah 12, Pusa No. 4, 7, Ford 6, Canberra 4, Florence and Hard Federation 3, Duri 2, and Yandilla King, Marshall's No. 3, Early Bird, Riverina, Gluyas Early, Currawa, Gresley, Aussie, and Bruce each one entry.

Seeding and Cultivation.

The rate of seeding averaged 51 lb. per acre (Manilla 58 lb., Tamworth 52 lb., Currabubula 43 lb., and Quirindi 50 lb.). In the Manilla competition seeding was carried out from the third week in March to early June,

at Tamworth from April to late May, at Currabubula from early April to mid-May, and at Quirindi from mid-April to early May. No cultivation (harrowing) was given after seeding to break any crust before the plants reached the surface or after feeding off. Four crops were fed off in the Manilla competition, ten at Tamworth, three at Currabubula, and five at Quirindi, mostly during May to June, rarely in July. Lodging was minimised thereby, and no ill-effects were noticed.

Diseases.

Take-all and foot-rot caused the greatest damage from disease, and were more in evidence than for some years. Frost damage was considerable, owing to the prolonged period of low temperatures. Flag smut, loose smut, stem rust, leaf rust, and leaf spot also occurred, but were not sufficiently in evidence to reduce yields or the quality of the grain. Bunt was found on three occasions, but the infection was only slight; in two cases the whole of the grain had been dusted with copper carbonate, and in the other, portion of the grain had been treated.

A few of the Nabawa crops showed flag smut, but very slightly mostly, and only on a small portion of the plant, and not occurring oftener than once every two or three chains. Grown in some instances where the previous crop had shown considerable infection with flag smut, this variety has again come through without reduction in yield from this disease. It is not safe, however, to depend upon it being entirely free. To prevent infection of the succeeding crop long fallow or rotation with oats is advised.

Comments.

Estimated yields ranged from 20 to 41 bushels per acre, indicating the high productivity of the soils and the suitability of the localities for wheat-growing, especially considering that the usual practice is almost continuous wheat-growing, with rarely more than three summer cultivations, and without the use of fertiliser. There is a bright prospect of levelling up in yields by application of approved methods. Generally good quality grain was produced. Tamworth entries were outstanding in freedom from admixture, and several were of pure seed standard.

Water-logging of the soil caused the greatest reduction in yields, and by weakening the plant made it more susceptible to disease. One of the ill effects of a water-logged soil is a deficiency of nitrates. This may be obviated by a top-dressing of sulphate of ammonia or nitrate of soda, but up to the present this has not been shown to be economical.

Observations show that a considerable loss of plants occurs through crusting (setting of the surface) before the plants are through. Harrowing after sowing and before the plants appear if rain has caused crusting is advised. Harrowing will also be found beneficial in some cases after stock have set the surface during feeding off.

Western Riverina.

H. J. DARGIN, Agricultural Instructor.

In the western portion of the Riverina competitions were conducted by four agricultural societies, viz., Narrandera P. and A. Association, and the Berrigan, Deniliquin, and Walliston branches of the Farmers and Settlers' Association. The interest taken in the competitions, not only by the competitors and the whole of the farming community, but by the townspeople and business men, was remarkable, and the educational value and beneficial results obtained from them was everywhere freely and favourably commented on. Seventy-eight crops were judged in all—Narrandera 23, Deniliquin 27, Berrigan 13, Walliston 15. There were twenty different varieties included in this total.

The Season.

After four successive years of dry and otherwise adverse seasonal conditions practically throughout the western portion of the Riverina wheat-growing centres, there were presented last season features entirely different and unexpected. Between June, 1930, and the following October from 6 to 8 inches of rain were registered at the various centres, which enabled ploughing operations to be carried out comfortably, while the fallows were thoroughly saturated in October, when between 2 and 3 inches fell. Further good rains fell in the Narrandera district during December, while at Berrigan, Deniliquin, and Walliston torrential downpours occurred, from 6½ to 10 inches being recorded for that month.

Further periodical rains fell throughout the Riverina during March, April, May, and June, no less than 12½ to 13½ inches of rain falling during this period. Such wet autumn and early winter months greatly handicapped wheat farmers, and prevented them from sowing anything like the total area that had been prepared. A number of farmers, rather than have a large area of cultivated land lying idle, risked sowing very late, as there was every indication of the wet conditions continuing, but from July till October a comparatively dry spell was experienced, with the result that a number of these late sowings hardly proved payable propositions, and were responsible for greatly reducing the average yield per acre. Swarms of grasshoppers made their appearance while these late crops were still very green, and in some localities destroyed big areas.

With so much moisture available, most of the early and midseason sowings of both wheat and oats made a rapid and somewhat forced growth, which farmers found impossible to check by feeding off with sheep on account of the fields being in a saturated and in some cases flooded condition; consequently many of the crops sown at these particular periods might have stooled better, and almost without exception grew very tall.

A very large percentage of the Riverina was sown with the midseason variety Nabawa, on account of its resistance to disease and its capacity to yield heavily under either wet or dry conditions, but owing to it growing

tall, because of not being fed off, and the natural weakness of the straw, a considerable amount of lodging took place, particularly during a heavy storm which passed over the Riverina on 16th November.

A number of crops sown at various parts of the district under discussion would have been benefited by a suitable fall of rain about September, but the cool weather conditions which continued throughout the ripening period till the end of November greatly assisted in filling the heads and minimising losses from stem rust, which made its appearance early in the season but did not develop to anything like the extent that might have been expected.

RAINFALL Table.

	Narrandera.	Deniliquin.	Berrigan.	Walliston.
	points.	points.	points.	points.
Fallow period (June, 1930, to March, 1931) ...	1,878	1,605	2,032	1,605
Growing period (1931)—				
April ...	142	248	250	248
May ...	517	334	411	334
June ...	555	409	454	409
July ...	98	108	104	108
August ...	72	72	91	72
September ...	127	171	106	171
October ...	93	129	142	129
November ...	...	...	...	...
Total, growing period ...	1,604	1,471	1,558	1,471
Grand total ...	3,482	3,076	3,590	3,076

Cultural Details.

Generally the fallows had received as much working as was necessary to assist sheep in combating the weed growth, and the seed-beds were in a moist and in a number of cases wet state at the time of sowing. The land on which eight of the twelve placed entries were grown had been ploughed between the months of May and June; two were ploughed in August, one in September, while the remaining one had not been fallowed and was turned over in December. Early preparation of the land was practised by nearly all of the seventy-eight competitors, forty-three completing this work by the end of July; a further twenty-five finished by the end of August and four in September, while the remaining six had not been fallowed. Mouldboard ploughs were largely preferred in the older wheat-growing centres, and most of the leading farmers in the newer districts also used this type of implement. Forty-four entrants used the mouldboard, thirty used disc ploughs or sundercuts, three used the Wimmera scarifier, and one field was prepared with a combine. The average number of workings given the fallows in each of the districts was as follows:—Narrandera 3, Berrigan 2.8, Deniliquin 2.8, Walliston 2.3.

Varieties.

The following table shows the number of times the different varieties were entered and their relative success:—

Variety.	Total Entries.	First Place.	Second Place.	Third Place.
Nabawa	31	...	...	2
Ranee	7½	...	...	...
Free Gallipoli ...	7	1	...	1
Federation	5½	1	...	...
Penny	5	...	...	1
Waratah	4½	1	1	...
Yandilla King ...	4	1	...	...
Bald Early	2	...	...	...
Union	2	...	1	...
Yanwood	2	...	...	...
Gallipoli	1	...	...	...
Aussie	1	...	...	...
Rajah	1	...	½	...
Ghurka	1	...	1	...
Canberra	1	...	...	...
Bena	½	...	...	...
College Purple ...	½	...	...	...
Major	½	...	...	...
Bobin	½	...	½	...
Nizam	½	...	...	...

During the past four or five years a gradual improvement has been noted in the purity of the seed used throughout the Western Riverina, but there is still room for a big improvement in the type and purity of seed of the various varieties being used. Of the crops judged, only a few were considered up to pure standard seed, and these did not happen to be the now popular or much sought after wheats. This was no doubt due to there having been very little true-to-type seed available locally during the previous three adverse seasons, coupled with the existing financial conditions. Those wheat-growers who are not in a position to purchase large quantities of seed are once again advised to obtain a small quantity of the varieties required from reliable sources recommended by the Department in the pure seed list published in the *Agricultural Gazette.*

Less attention was paid this season than in those preceding to treatment of seed for prevention of bunt. The risk which the farmers took in saving this expense can no doubt be attributed to the prevailing price for wheat, the financial conditions referred to, and the fact that wheat crops have been so free from infection with this disease in recent years. Less than twenty out of the seventy-eight farmers whose entries were judged sowed seed which had not been treated, but in the previous year the whole of the crops inspected were treated. It was also found that many other farmers who were not competitors had failed to treat their seed this season. Fortunately ball smut (bunt) was not found affecting any crop throughout the districts visited, but wheat-growers generally are advised to use copper

carbonate when sowing this autumn and not again to risk the possibility of serious infection and losses from this disease.

Rate of Seeding.

The following table shows the various amounts of seed used by competitors:—

District.	Seed per acre.					Total No. of Entries.
	45 lb. per acre.	50–56 lb. per acre.	60–65 lb. per acre.	70–75 lb. per acre.	80 lb. per acre.	
	Competitors.	Competitors.	Competitors.	Competitors.	Competitors.	Competitors.
Narrandera ...	2	4	15	2	...	23
Berrigan ...	...	4	8	1	...	13
Deniliquin ...	...	...	19	8	...	27
Walliston ...	1	2	6	4	2	15
Total ...	3	10	48	15	2	78

Of the twelve placed crops in the competitions, one was sown at the rate of 45 lb. per acre, one at 50-56 lb. per acre, seven at 60-65 lb. per acre and three at the rate of 70-75 lb per acre.

Quantity of Superphosphate.

Less manure per acre was used by farmers throughout the Riverina this year than has been the case for a number of years. This cannot be taken as a tendency to favour lighter applications, but merely a sign of the times. The wet season was favourable to successful germinations and farmers found it imperative to reduce expenses.

The following table shows the number of crops to which the various quantities of superphosphate were applied per acre in each of the districts:

	Superphosphate per acre.								Total No. of Entries.
	Nil.	30–35 lb.	45-45 lb.	50–56 lb.	60–65 lb.	70–75 lb.	80–85 lb.	90 lb.	
Narrandera	4	3	7	2	4	1	1	1	23
Berrigan ...	5	2	3	2	1	...	...	...	13
Deniliquin	12	1	5	5	4	...	...	...	27
Walliston ...	2	1	4	4	2	...	...	2	15
Total ...	23	7	19	13	11	1	1	3	78

Diseases and Weeds.

Considerably more foot-rot was found affecting crops throughout all districts than is usually the case. Leaf spot (*Septoria*) was also a little more prevalent, while loose smut has been found to have made much headway during the past few seasons. Serious consideration must be given to sowing

fresh seed from unaffected crops, as (owing to the economic position, no doubt) much of the seed has been used too often, and this parasitic fungus has been gradually increasing by being carried over in the seed from year to year. A most pleasing feature, however, was the tremendous reduction in wheat fields found badly affected by flag smut. It is practically impossible to estimate the amount of money that has been saved the farmers and the State in recent years by the introduction of disease resistant varieties of wheat such as Nabawa. Stem rust made its appearance early in the season, and as many crops made a rank succulent growth owing to wet conditions preventing feeding off, trouble was expected from this source, but fortunately a long, cool season set in and not a great deal of damage resulted.

Some crops contained large quantities of wild oats. Saffron thistle and wild mustard were also present in a number of crops growing on old cultivation land. Owing to the wet conditions experienced this season, crowfoot was somewhat troublesome in some crops, while in some localities a little cockspur was found.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6,200
Swane Bros.	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

C. G. Savage, Director of Fruit Culture.

The Central North Coast Tomato-growing Competitions, 1931.

Extracts from the Judge's Report.

JOHN DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

TOMATO crop-growing competitions were again conducted by the co-operative association of the central north coast tomato-growers with the object of encouraging farmers to adopt improved cultural methods and use better varieties, as well as to bring them into contact with departmental officers and the most up-to-date advice available.

Judging was carried out during the period 2nd to 5th November, 1931. In the previous year one competition only was conducted for crops, irrespective of the method of growing, but this year the committee decided to make two sections, to be judged separately, one for staked crops and the other for unstaked crops.

The scale of points for judging was also revised, particularly in regard to the points allotted for yield. Naturally yield is the most important aspect, but with the tomato crop yield is very difficult to judge because of the long period over which the fruit comes to maturity. In previous years some competitors suffered monetary losses through leaving fruit on the plants for judging, and for this reason it was decided to allot the points for yield under two headings, as follows:—Visible yield—or that portion of the crop already harvested plus the mature and large green fruit actually on the plants—35 points; prospective yield—or fruit that should be harvested—15 points.

In estimating the yields I took into consideration such points as the variety, since an early-maturing variety does not yield as persistently as a late type and has a smaller prospective yield, and the knowledge of the grower in regard to pests and diseases, and whether he was carrying out control measures to minimise losses.

Practically every crop was infested with thrips; some crops so badly as to cause the majority of the flowers to fall, and yet not one competitor was aware of the presence of thrips. Rutherglen bug was widely distributed, but did not seriously affect the yields, and the black potato weevil damaged some fruit touching the ground.

Rain fell during the whole of the judging period, and the weather was very favourable to an outbreak of Irish Blight; some crops on the ground and with an abundance of sappy growth showed actual blight infection on the lower leaves. Fusarium wilt was noticed on several occasions, and it is pleasing to record that only a very small amount of virus disease was present, although bronze or spotted wilt, mosaic and rosette were seen.

The Season.

Dry weather was experienced in all the districts represented in the competitions, providing ideal conditions for those growers with irrigation facilities. Rain in the spring always reduces soil temperatures and encourages the development and spread of fungous diseases. Naturally on unfallowed and non-irrigated country the dry weather is a very serious disadvantage from a growing point of view, but dry weather is always experienced during the spring in coastal areas, and as the tomato crop demands a regular and plentiful supply of water after the fruit is set, it can be well realised that irrigation is essential to good and regular production. It was very pleasing to see that a number of growers had installed irrigation systems for the present crop, indicating that they are in the tomato-growing business permanently, and intend to overcome the serious obstacle of dry weather.

This district, with its ideal early tomato situations, excellent soil, and hundreds of permanent water supplies, has the opportunity of becoming one of the greatest early tomato districts.

The Staked Competition.

Mr. W. A. Robinson, of Boambee, gained first and second place with the two entries he submitted in this competition, both being part of a 2-acre block. His methods followed closely departmental recommendations. Points were lost for quality in the winning entry because of the inclusion of the pink type (June Pink) and because of the quality of that variety and of Early Winner. The tremendous setting of Bonny Best, which is slightly later than the other varieties, was responsible for the good points scored for prospective yield.

The average quality was higher in the entry placed second, but one point was lost for purity due to a number of "off-type" plants in Boambee Pride. Rosette in a few plants and small numbers of thrips, black beetle, and grubs caused the loss of a point for freedom from diseases and pests.

Messrs. Wood, Bennett, and Carter, who were placed third, adopted excellent methods in seed-bed, field, and irrigation work, and their crop of Bonny Best scored full points for quality.

Of the remaining competitors, Mr. A. E. Johnson lost points for low apparent yield, the result of neglect of pruning followed by poor setting and a backward condition of the early bunches, while Mr. R. A. Grant lost points for prospective yield because of the presence of pests and diseases, though the condition of the soil in this entry was almost perfect.

The low score of Messrs. Hall and Munro was due to lack of irrigation, to the plants being too close together, and to the presence of disease. The first two prevented normal development of the plants, and resulted in small fruit showing black spot, and fusarium wilt was introduced in the seed which had been purchased. Seldom, if ever, is the expenditure of money on staking and pruning warranted if irrigation is not practised, for the advantages of these methods are lost without the help of irrigation.

The points awarded the various competitors are shown on next page.

AWARDS in Central North Coast Tomato-growing Competition, 1931.

Grower.	District.	Variety.	Quality. (Maximum, 10 pts.).	Purity. (Maximum, 10 pts.).	Cultivation. (Maximum, 10 pts.).	Freedom from Diseases and Pests. (Maximum, 10 pts.).	Yield. Visible. Half-bushel Cases.	Yield. Visible. Points Scored. (Max., 35 pts.).	Yield. Prospective. Half-bushel Cases.	Yield. Prospective. Points Scored (max., 15 pts.).	Total Points. (Max., 100 pts.).
		Staked Section.									
W. A. Robinson (No. 2)	Boambee	June Pink, Early Winner, Bonny Best.	8½	10	10	9½	1,300	35	450	13½	86½
W. A. Robinson (No. 1) ...	,, ...	Break O' Day, Boambee Pride, Marvarna, Rapid Red, Dromore Favourite.	9	9	10	9	1,300	35	400	12	84
Wood, Bennett, and Carter ...	Valla	Bonny Best	10	10	10	9½	1,100	29½	300	9	78
A. E. Johnson	Boambee	,, ...	10	10	7	9	450	12	500	15	63
R. A. Grant	,, ...	,, ...	10	9	10	8½	550	15	200	6	58½
Hall and Munro...	Nambucca Heads...	,, ...	10	9	7	5	140	4	80	2½	37½
		Unstaked Section.									
Henderson and Pade (No. 1) ...	Valla	First and Best	8½	9½	8½	8½	600	35	300	8	78
Henderson and Pade (No. 2) ...	,, ...	,, ...	8½	9½	8½	9½	500	29	300	8	73
V. Gore	Missibotti ...	Early Winner	9	10	9½	9½	300	17½	550	15	70½
J. and K. Downie (No. 1) ...	Urunga	Pink Queen	8½	10	10	9½	400	23	300	8	69
W. J. Knobbs	Valla	Sunnybrook Earliana	9	9½	10	9½	350	20½	300	8	66½
O. Tacon and Beer	,, ...	Early Pride	8	9	9	9½	410	24	115	3	62½
A. J. Rowe	Macksville ...	,, ...	9	10	8½	9½	320	19	200	5½	61½
J. Tutt	Valla	Sunnybrook Earliana	9½	9½	8	9½	210	12	350	9½	58
J. and K. Downie (No. 2) ...	Urunga	Pink Queen	8½	10	8	9½	150	9	400	11	56
R. Thompson	,, ...	Spark's Earliana	9½	9	9	9½	180	10½	210	6	53½
Graham and Jarrett	Macksville ...	Early Pride	9	10	8	8	250	15	100	2½	52½

The Unstaked Section.

Eleven entries were received for this section of the competition.

Messrs. Henderson and Pade won first prize with a ground crop of First and Best, and obtained second place with a later section of the same crop. Their success was due to correct irrigation methods, the filling out of the early bunches of fruit being exceptionally good, but points were lost for prospective yield, because of inadequate disease control. The foliage of the crop was very heavy and Irish blight was showing up in small patches, with a few mature fruit slightly affected. Bordeaux mixture was not being used, and the weather was wet. The plants in this crop were set too close.

In the second entry by these growers, the danger of disease was not as great, since the crop was not quite so advanced.

Mr. V. Gore won third place with a crop which at the time of inspection was most outstanding in many respects, its only serious defect being that the seedlings were planted too close together. The plot, which was on a gravelly ridge, had benefited greatly from a green manure crop of lupins, and diseases and pests were well controlled, though one plant affected with spotted wilt was seen. The crop did not have a great visible yield, since it was a late crop, but it showed easily the heaviest prospective yield in the competition. An excellent overhead irrigation system is installed on this property.

Features of interest among other crops were the placing of lines of saplings 1 foot off the ground along each side of bush plants by Messrs. J. and K. Downie to keep the branches and clusters of fruit off the ground, and the use of cow manure, in conjunction with artificial fertilisers, by these growers with good results.

The points awarded are given in the table on page 224.

Comments on the Competition.

Naturally with the big area planted at different seasons each year, large consignments of tomatoes will continue to be sent from this district to the southern markets, but the impression gained from a survey of the results of the competitions is that there must be considerable improvement in knowledge and methods before the individual Central Coast grower can become a consistent supplier of early tomatoes. The district average yield of early fruit is too far below what could be produced, and the risks taken are too great. Last season blight accounted for thousands of plants, but this year the number of men who sprayed with Bordeaux mixture was very small. Not one competitor knew thrips and the damage to be expected.

The fertiliser practice, generally speaking, was good, but no reliable data is to hand as to the most economical and efficient fertilisers to use in these localities, and many quite bad mistakes were made. The varieties planted were generally suitable.

The cultural methods of the growers of staked crops were good throughout. The results from crops, however, showed that this method leaves too great a margin of risk, to be closely followed each year. It is a pity, now

that so many men have installed irrigation, that stake growing is not more generally carried out. It should be remembered that under equal conditions, with the same variety, staked and pruned plants will produce fruit at least ten days earlier than unstaked. There are also many other advantages to be gained, such as better quality in the whole of the fruit, and the elimination of risk of plants being blown about in the early stages of growth. A staked crop can be more quickly and efficiently cultivated, harvested, irrigated, and sprayed or dusted. A staked crop being off the ground is not so subject to injury by diseases and pests as a crop on the ground. Again, it has been conclusively proved that staked tomatoes (being planted much closer) will produce, over a number of years, a greater bulk of fruit than unstaked plants. Another point to be remembered in these districts is that earliness is a very desirable feature. Therefore, if the majority of growers would devote their time to a small area of staked tomatoes rather than a large area of unstaked, better results would be obtained. With disease and pests plentiful in the district, the time is not far distant when crop rotation will be of more importance than it is at present. It may then be found difficult to arrange a suitable rotation on the best soils for a big area of bush tomatoes.

That the growers are beginning to gain the finer points of tomato-growing was shown by the number of men raising plants under cover, and also by the number of inquiries made for advice on seed selection. Experience has shown that one of the first points adopted by successful tomato-growers is the selection of their own seed.

Potato Trials at Wollongbar Experiment Farm.

The results obtained from last season's trials at Wollongbar Experiment Farm, states Mr. G. Giles, Experimentalist, in his report, tend to confirm the experience of previous years, wherein seed selection and moderate dressings of superphosphate have shown to advantage when growing early-sown potatoes under Far North Coast conditions.

The plots were sown on 17th August last and harvested on 3rd December, when the following yields were recorded:—

Variety.	*Yield.* t.	c.	qr.	lb.
Factor (Batlow certified)—Manured	4	12	1	18
Alpine Wonder (Satisfaction type)—Manured ...	3	17	2	10
Factor (unselected)—Manured	3	16	3	12
Factor (Batlow certified)—Unmanured	3	11	1	23
Factor (unselected)—Unmanured	3	1	2	15
Alpine Wonder (Satisfaction type)—Unmanured ...	2	12	2	5
Alpine Wonder (Early Rose type)—Manured	2	0	3	1
Alpine Wonder (Early Rose type)—Unmanured ...	1	7	0	1

All selections of Factor gave better class tubers than Alpine Wonders, which were somewhat small for market purposes.

Cane Growing Competitions, 1931.

REPORT OF THE RICHMOND RIVER CONTEST.

L. S. HARRISON, Special Agricultural Instructor.

SUGAR-CANE competitions were again conducted in the Richmond River district this season under the auspices of the Empire Vale Branch of the Agricultural Bureau of New South Wales, and though last year competitions were completed for both one-year and two-year canes, this season one year canes only competed, all varieties being Q.813 with the exception of two crops of Nanemo entered by Messrs. Meaney and P. T. Flood. Nineteen entries were attracted.

These competitions are of importance to growers on the river, and the information they provide is of value, particularly from the cultural standpoint. The methods adopted make a big difference to the resulting crop, and if reasonably standardised methods can be evolved by means of these competitions so as to increase production and commercial return with little, if any, increase in expenditure, the competitions must be considered of value. Variations in soil where they occur would of course necessitate a modification of treatment suited to the needs of the particular soil.

Details of the Winning Crops.

B. Plenkovitch.—The land, which was a medium heavy alluvial with a sandy mixture, had been under cultivation for approximately fifty years, but for a portion of that time had not had particularly good cultural treatment. A crop of maize immediately preceded the competition crop, but for two or three previous years the land carried no crop.

Ploughing took place in July, after which the land was harrowed, reploughed, and harrowed again. The plot was planted in early October with a machine in drills, sets being dropped about 8 inches deep and covered approximately 4 inches in rows 4½ feet apart. Sulphate of ammonia at 1¼ cwt. to the acre was used as a top-dressing about three months after planting. The paddock was harrowed, ploughed away, middled, scuffled three times, hand chipped and middled with scarifier.

The crop was a satisfactory one and this condition was largely contributed to by careful attention to cultivation.

It might be mentioned here that all growers used the hoe as required, but as this is a general operation it has not been mentioned on every occasion, as it is used, of course, specifically for the control of weeds at a later stage of growth of the crop.

T. W. Meaney.—This land, which was of a heavy semi-swampy type, had been under cultivation with cane for about forty years. The paddock was subsoiled in November, 1929, after cane had been ploughed out the previous month. It was then ploughed again and cowpeas were planted in January, 1930. Excessive rain fell through the autumn, making cultivation on that

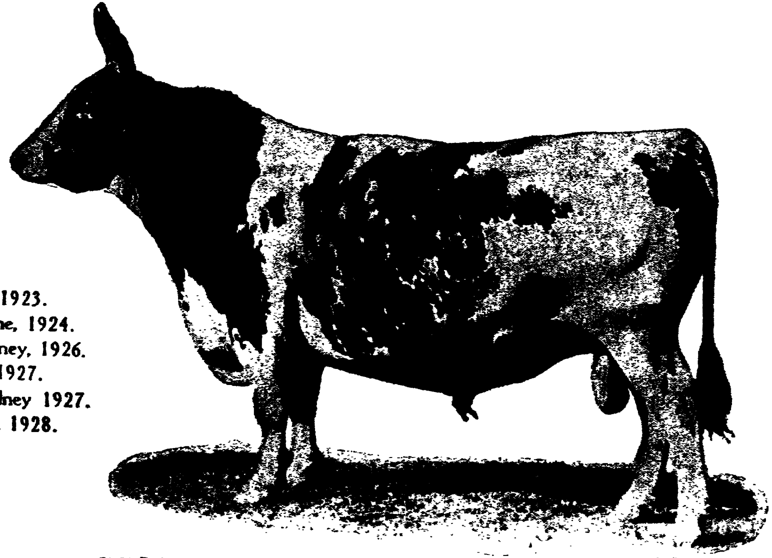
particular land somewhat difficult. However, it was twice ploughed again before planting in early October. A plough-furrow was opened and the sets were hoed in, in a 6-inch furrow with about a 4-inch cover. The rows were about 5 feet apart and sets were dropped about 18 inches apart. In December, 1 cwt. of sulphate of ammonia to the acre was applied alongside the rows. After planting the paddock was ploughed away, cover raked off, scuffled, middled, and cultivated six times.

P. M. Carney.—This again was old cultivation land, but had been out for about fifteen years before 1924; the competition crop was the second crop of cane within the last twenty years. The paddock was subsoiled to a depth of about 18 inches prior to maize being planted in January, 1930. The result of this practice is being watched with considerable interest, as it is considered that heavy soils of this type will benefit considerably thereby. A number of cane-growing areas on the Richmond are of this heavy type, and some such system may in future be regarded as a definite part of the treatment. The stalks from the maize crop were burnt and the paddock was disc-harrowed and ploughed fairly deep in August. After that it was harrowed, re-ploughed, ploughed again and disc-harrowed. The sets were dropped by machine in 7-inch plough drills with a 7-inch cover, in mid-September in rows 4½ feet apart, the sets being dropped about 1 foot apart in the rows. A portion of this area was top-dressed with 1 cwt. of sulphate of ammonia to the acre. After planting the crop was harrowed, ploughed away, rotary chipped, cultivated four times with a disc, middled and scuffled.

AWARDS in Richmond River Cane-growing Competition, 1931.

Competitors.	Cultivation (Max. 20 points).	Evenness and Lack of Patchiness (Max. 20 points).	Stooling (Max 10 points).	Freedom from Disease (Max. 15 points).	Freedom from Lodging (Max. 10 points).	Points for Commercial Value of Crop.	Estimated tonnage per acre.	P.O.C.S.	Total Points.
B. Plenkovitch	18½	18	8	15	10	13	25	15·3	82½
T. W. Meaney	18½	17½	8½	14½	10	13	23	16·5	82
P. M. Carney	18	18	9	15	8	13	28	14·3	81
J. T. Rodgers	17	17	8½	15	10	13	26	15·3	80½
J. Curran	18½	16½	7½	15	9	13	28	14·6	79½
Estate H. Leeson (deceased) ...	18	15½	8	15	10	13	25	15·3	79½
J. W. Riley	17½	16	8½	15	9	13	27	14·7	79
J. Moylan	17½	16½	8	15	10	12	23	15·3	79
W. J. Ellis	17	15½	7½	15	10	14	26	15·5	79
J. J. Meehan	17½	16	7½	15	10	13	23	16·4	79
W. Cruickshanks	16	15½	8½	15	7	16	35	13·9	78
A. W. Rippon	15½	16½	7½	15	8	15	33	14·3	77½
A. and T. Cupitt	16	19	8½	15	5	14	35	13·2	77½
W. Durrington	16½	15½	7	15	9	14	28	15·0	77
P. J. Flood	18	15	8	15	10	11	20	15·8	77
A. and A. E. Watson	18½	15½	8	15	10	7	16	13·9	74
P. T. Flood	16½	15½	8	14½	10	9	16	15·9	73½
P. McDonald	18½	15½	7	15	10	6	12	15·5	72
S. W. Tully	17	14½	6½	15	10	6	12	15·4	69

1st—2 yrs.—Melbourne, 1923.
1st & Champ.—Melbourne, 1924.
1st & Res. Champ.—Sydney, 1926.
1st & Champ.—Sydney, 1927.
2nd Bull & Progeny—Sydney 1927.
1st Bull—4 yrs.—Sydney, 1928.



First 27 females sired by Scottish Pride of Gowrie Park (3797) averaged 243.6 lb. butter-fat in 273 days on first calves as two-year-olds.

SCOTTISH PRIDE OF GOWRIE PARK (3797).

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The Department also has for sale young bulls from tested dams of the following breeds:—

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Comments.

It is recognised that probably the most important feature in regard to the growing of satisfactory cane crops on the Richmond River is suitable drainage. This is of continual importance, and it is satisfactory to find that growers are already aware of how any lack of facilities for drainage will interfere with production, and to find so many growers who are closely watching this essential aspect of production. It is to be hoped that all growers on land that requires such treatment will do what is possible. The occasional dry weather that is met with is of less importance, because by careful attention to cultural operations rain shortage can usually be overcome by conservation of moisture.

This season beetles caused considerable damage to young cane areas on the Richmond, and at present they are to be regarded as a menace somewhat difficult to control. Some crops in this competition were undoubtedly interfered with by the beetles, and in all probability some crops which would have "pointed up" particularly well were placed in a very low position because of them. It is highly probable that beetles affected the yield to a considerable degree in the case of Mr. P. J. Flood, and they can most decidedly be considered responsible for the low yield of the entry of Messrs. A. and A. E. Watson. With Mr. S. W. Tully, beetle damage very seriously affected the crop and largely reduced the tonnage.

Mr. P. T. Flood's somewhat low yield would appear to be due to a distinct check on account of a moisture shortage which interfered with the crop to such an extent that complete recovery did not occur. In the case of Mr. P. McDonald flood damage caused a distinct check to the crop from which it never made a complete recovery.

Only three competitors ploughed in green crops prior to cane. These green leguminous crops are of distinct importance to the ensuing cane crop, being valuable means of improvement and maintenance of soil fertility—having a direct nitrogenous value as well as adding humus which enriches the soil, makes plant-food available and improves the texture and the ability of the soil to absorb and retain moisture. Cowpeas are preferable to field peas as seasonal conditions are more suitable and a longer time is allowed for the thorough decomposition of the vegetable matter. These crops lose the greater part of their nitrogenous value if allowed to ripen and dry off before being ploughed in.

Admittedly a number of competitors planted cane after maize, but this, although an excellent practice since soil improvement is effected through ploughing in the stalks, and since the crop gives a commercial return, has not a soil improvement value as great as the turning in of a green leguminous crop, such as cowpeas. When maize stalks are ploughed in late or just before planting, it may occur, that in dry springs, insufficient moisture is available to break the stalks down entirely, thus causing a liability to air spaces in the soil and a drying out of soil moisture which cannot be spared

at that juncture. This early ploughing is a matter of even greater importance when a heavy cover of dry stalks is being turned under. Special attention was drawn to this aspect last year.

It is important to note that of the crops filling the first four places, two were on old land, one on old land which had received a three-year spell, and one on old land which had had a seven-year spell; again, second and third places were filled by crops grown on land subsoiled before this cane crop, and only one other block in the competition had been so treated. Interestingly, the first three crops had each had an application of fertiliser, and in two other instances only had crops been fertilised.

The Colonial Sugar Refining Company contributed most valuable work in connection with this competition, both in the field and in augmenting the prizes.

Best Strain of Factor Potatoes for Hunter River District.

In an attempt to solve this problem trials were again carried out last spring, Messrs. N. S. Porter, Hinton, and A. McKimm, Bolwarra, West Maitland, co-operating with the Department.

In the selection of strains for inclusion in these trials special attention should be given to freedom for virus diseases—one of the biggest factors influencing yields. Generally speaking, the amount of virus infection in the plots last year was greater than usual, which means either that the season favoured the disease, or that there is need for more rigid selection.

The results are given below, and again demonstrate the superiority of McPaul's strain of Factor for the Hunter River district. Although it was beaten for yield at Bolwarra, it contained the lowest percentage of virus infection. The yields obtained last season also emphasise the value of proper cultural methods, as the season was very droughty, practically no useful rain at all falling during the growing period.

Yields in Strain Trials with Factor Potatoes.

Strain.	N. S. Porter, Hinton.			A. McKimm, Bolwarra.		
	tons.	cwt.	lb.	tons	cwt.	lb.
A. W. McPaul, Taralga ...	5	7	80	5	16	88
A. Gorman, Bannister ...	5	7	56	...		
A. Price & Son, Bannister ...	5	0	32	...		
J. R. Briens, Oberon (Early Rose)	4	4	56	...		
W. Gay, Kialla	3	19	12	...		
R. Stale, Kialla	3	2	0	4	12	76
J. W. Walsh, Taralga ...	...			6	0	60
R. H. Quamby, Batlow ...	...			5	10	40
J. J. Maloney, Taralga ...	...			5	6	8
A. H. Price, Bannister ...	...			4	13	24
E. Pryor, New England ...	...			3	10	80
H. E. Price, Bannister ...	...			3	3	24

—John Douglass, Agricultural Instructor.

Thrips.

EXPERIMENTS FOR THE CONTROL OF *Thrips imaginis* BAGNALL.

E. H. ZECK, and N. S. NOBLE, M.S., B.Sc.Agr., Assistant Entomologists.

Thrips imaginis occurs each year in limited numbers, but for a period of a few months during certain years climatic conditions become so favourable for its development that it occurs in serious pest numbers. Favourable conditions prevailed during the latter half of 1931, resulting in extensive reduction in the setting of certain stone and pome fruits, although part of the reduction is considered to have been due to other factors.

In this article is given a brief account of the behaviour of the insect and a record of the killing powers of certain sprays and dusts.

Thrips imaginis, which is a native species, occurs over a wide area and on an extensive range of host plants. The adults fly readily, and it is thought that with the assistance of the wind they may be carried considerable distances.

Adult of *Thrips imaginis* Bagnall.

The pest was observed in weeds in the late winter, and specimens were collected from peas on 3rd September, 1931, and from flower heads of lamb's tongue (*Plantago lanceolata*), apple and peach in the Sydney district on 23rd September, 1931. With the opening of the fruit blossoms in the spring their numbers had increased, and they invaded the blossoms in suburban gardens and in orchards over a large part of the State. Their numbers continued to increase throughout October, when the greatest damage is considered to have been done. Counts of the thrips present in single rose blossoms collected in Sydney on 27th October, 1931, gave totals of 2,341, 2,159 and 4,130, with an average of 2,877 per blossom. In various parts of the State during the latter part of October, countless numbers of thrips were observed in flight, and in parts of Sydney at this time they were so numerous on citrus as to almost obscure the petals.

From the beginning of November their numbers showed a steady decline, and by the middle of November, although many were still present on roses in Sydney, they were no longer causing noticeable injury. The thrips continued to decrease in number, and an inspection of the Sydney district on 10th December, 1931, revealed only occasional thrips in the blossoms.

Description and Habits.

Thrips imaginis was first described in 1926 by R. S. Bagnall (*Ann. Mag. Nat. Hist.* (9) xviii, pt. iii).

The adult thrips are light-brown in colour, and measure slightly less than one twenty-fifth of an inch in length. Two pairs of narrow and extremely delicate wings, fringed with long hairs, are present, and when the insect is not in flight they lie along its back.

The eggs, which are extremely minute, are inserted in various parts of the flower by means of the saw-like ovipositor of the female. The eggs hatch, and the larvae commence to feed within the flowers. The young resemble the adults in general appearance, except that the wings are not developed and they are smaller in size and lighter in colour. When fully-fed the mature larvae enter their pre-pupal and pupal stages in the ground, and during this period they do not feed, although they are capable of crawling about slowly. Finally, the adults emerge and fly back to the flowers to feed.

Nature and Extent of Injury.

The insect possesses a mouth which is developed for piercing and rasping, and with this it feeds upon the various parts of the flowers, frequently entering the opening blossoms and so injuring them that they turn brown, fail to open, and may fall prematurely, thus preventing the setting of fruit. The deposition of eggs within the flower stalk may also be responsible for some of the early blossom fall.

In the recent infestation the stone fruits were first attacked, the prune, plum and peach crops in certain districts being very considerably reduced. Later, the thrips attacked pome fruits, causing serious injury in apple and pear blossoms.

It was noted in the case of both the pome and stone fruits, that there was considerable varietal variation in the quantity of fruit set, and this was considered to be partly due to the variation in the structure of the flower, a variety with more robust stamens and pistil tending to withstand the attack of the thrips and so set more fruit.

Although thrips were abundant on citrus and grape vines, they did not affect the satisfactory setting of fruit. The early vegetable crops were attacked and some losses resulted in tomatoes and beans, but later crops were free from injury. The flower gardens suffered very severely in October and November. The thrips entered the opening blooms, and rasping the petals of roses and other flowers, caused them to turn brown. Sometimes this prevented the blooms from opening, but if they did open, the thrips crowded into them in such numbers that their presence alone rendered them objectionable for decorative purposes, their dark excrement on light-coloured blossoms adding to the disfigurement. Dark-coloured blossoms appeared to be less subject to attack, but in this case the injury would not be so evident.

Control Experiments.

At the commencement of the infestation a series of laboratory tests were undertaken in order to ascertain the toxicity of various spray mixtures and dusts to the thrips. In addition, certain promising sprays and dusts were used in the field on a variety of plants in order to test their effect upon the foliage and blooms. Other chemicals were tested for their possible repellent value.

Laboratory Methods.—Blossoms of various kinds, mainly roses, infested with thrips were gathered and brought into the laboratory. The sprays were mixed immediately prior to use and the thrips were shaken into a 4-inch diameter circle drawn on a sheet of unglazed paper, the spray being directed on to them with an ordinary hand atomiser. The dusts were applied with a small bulb hand duster.

The thrips on the papers were thoroughly sprayed or dusted and left for three minutes, after which counts of the number of thrips remaining within the circle were made, those outside the circle being removed. The papers were then left until the following day, when counts of the dead thrips were made and the percentage kill calculated.

In most instances the following figures represent the combined results of two, and in some cases three, separate spraying tests:—

RESULTS of Spraying and Dusting Tests.

Treatment.	Number within circle 3 minutes after spraying.	Number dead within circle on morning following spraying.	Percentage kill.
1. Nicotine sulphate, 1 in 100, plus 1 lb. hard soap to 25 gals. of mixture	195	147	75·38
2. Nicotine sulphate, 1 in 200, plus 1 lb. hard soap to 25 gals. of mixture	316	167	52·85
3. Nicotine sulphate, 1 in 300, plus 1 lb. hard soap to 25 gals. of mixture	340	115	33·82
4. Nicotine sulphate, 1 in 300, no soap	196	3	1·53
5. Nicotine sulphate, 1 in 400, plus 1 lb. hard soap to 25 gals. of mixture	411	53	12·89
6. Nicotine sulphate, 1 in 500, plus 1 lb. hard soap to 25 gals. of mixture	268	23	8·58
7. Nicotine sulphate, 1 in 600, plus 1 lb. hard soap to 25 gals. of mixture	438	42	9·59
8. Nicotine sulphate, 1 in 800, plus 1 lb. hard soap to 25 gals. of mixture)	148	6	4·05
9. Kerosene emulsion, 1 in 11 (¼ lb. hard soap to 11 gals. of mixture)	51	51	100·00
10. Kerosene emulsion, 1 in 20 (1 lb. hard soap to 20 gals. of mixture)	107	107	100·00
11. Kerosene emulsion, 1 in 22 (¼ lb. soap to 22 gals. of mixture)	71	71	100·00
12. Kerosene emulsion, 1 in 33 (1 lb. hard soap to 33 gals. of mixture)	274	273	99·64
13. Kerosene emulsion, 1 in 40 (2 lb. hard soap to 40 gals. of mixture)	227	211	92·95
14. Kerosene emulsion, 1 in 50 (2 lb. hard soap to 40 gals. of mixture)	199	197	98·99
15. Kerosene emulsion, 1 in 60 (2 lb. hard soap to 60 gals. of mixture)	340	334	98·24
16. Kerosene emulsion, 1 in 70 (2 lb. hard soap to 70 gals. of mixture)	97	95	97·93
17. Kerosene emulsion, 1 in 80 (2 lb. hard soap to 80 gals. of mixture)	81	81	100·00
18. Kerosene emulsion, 1 in 100 (2 lb. hard soap to 100 gals. of mixture)	135	134	99·25
19. Benzol emulsion, 1 in 11, (¼ lb. soap to 11 gals. of mixture)	59	49	83·05
20. Miscible white oil (A), 1 in 20	196	115	58·67
21. ,, 1 in 40	240	116	48·33

RESULTS of Spraying and Dusting Tests—*continued.*

Treatment.	Number within circle 3 minutes after spraying.	Number dead within circle on morning following spraying.	Percentage kill.
22. Miscible white oil (A), 1 in 60	154	77	50·00
23. Miscible white oil (B), 1 in 20	150	93	62·00
24. " 1 in 40	115	72	62·60
25. " 1 in 60	135	43	31·85
26. Miscible white oil (C), 1 in 60	86	31	36·04
27. Emulsified oil (A), 1 in 20 ...	62	31	50·00
28. " 1 in 60 ...	86	5	5·81
29. " 1 in 100...	63	4	6·34
30. Emulsified vegetable oil (B), 1 in 11	55	55	100·00
31. Emulsified vegetable oil (B), 1 in 21	110	109	99·09
32. Emulsified vegetable oil (B), 1 in 31	56	56	100·00
33. Emulsified vegetable oil (C), 1 in 30	118	9	7·62
34. Emulsified vegetable oil (D), 1 in 30	113	113	100·00
35. Miscible white oil (B), 1 in 40, plus nicotine sulphate, 1 in 600	115	48	41·73
36. Miscible white oil (B), 1 in 100, plus nicotine sulphate, 1 in 600	188	27	14·36
37. Miscible white oil (C), 1 in 60, plus nicotine sulphate, 1 in 600	168	91	54·16
38. Hard soap, 1 lb. to 5 gals. water	194	153	78·86
39. Hard soap, 1 lb. to 10 gals. water	97	40	41·23
40. Lime-sulphur, 1 in 25 ...	70	8	11·42
41. Lime-sulphur, 1 in 25, plus 1·75 grms. casein-lime spreader per pint	280	29	10·35
42. Lime-sulphur, 1 in 15, plus 1·75 grms. casein-lime spreader per pint	155	32	20·65
43. Lime-sulphur, 1 in 25, plus nicotine sulphate, 1 in 600 ...	191	54	28·27
44. Lime-sulphur, 1 in 25, nicotine sulphate, 1 in 600, plus 1/48 oz. casein-lime spreader per pint	245	38	15·51
45. Lime-sulphur, 1 in 25, nicotime sulphate, 1 in 600, and emulsified oil (A), 1 in 100 ..	132	132	100·00
46. Bordeaux mixture, 6-4-80 ...	53	8	15·09
47. Bordeaux mixture, 6-4-80, plus nicotine sulphate, 1 in 600	144	80	55·55
48. Bordeaux misture, 6-4-80, plus miscible white oil (A), 1 in 100	140	15	10·71
49. Japanese proprietary mixture, 1 lb., soap powder, 1½ lb., water, 50 gals.	130	100	83·84
50. Proprietary spray powder, 1¾ oz. to 2½ gals. water ...	85	52	61·17
51. Pyrethrum, 1 grm., hard soap, 1 grm., water, 500 c.c.	103	71	68·93
52. Alum, 1 lb. to 5 gals. water...	126	5	3·96
53. Pyrethrum dust	142	137	96·47
54. Nicodust, 2½ per cent. ...	236	192	81·35
55. Proprietary dust	142	136	95·77
56. Sulphur smoke	85	6	7·05
57. Tobacco dust and lime in equal parts	96	18	18·75
58. Control (untreated)	550	50	9·09

Notes on Spraying.

A notable feature of the majority of the sprays was their inability to wet the thrips. Almost all the spray mixtures on striking the body of the thrips formed spherical droplets which rolled off the insects' bodies. Both Bordeaux mixture and lime-sulphur failed to wet the thrips, and the addition of a spreader to the lime-sulphur gave only a slight improvement in the wetting power. Kerosene emulsion was a notable exception to the general rule, as it wet the thrips thoroughly, forming a thin film over the whole body.

After the application of many sprays, particularly the various dilutions of nicotine sulphate, all the thrips appeared to have been killed, but recovered even after a period of five hours. With the stronger kerosene emulsions the thrips became inactive as soon as the spray was applied, but with the weaker dilutions the action of the spray was less rapid, though the final kill was almost as satisfactory.

Spray Injury.—As kerosene emulsion gave such excellent results under laboratory conditions, a number of field tests were carried out in order to

ascertain its effect upon the blossoms and foliage of various plants, both with single and repeated applications.

As a result of these tests it was found that six applications of kerosene emulsion at a dilution of 1 in 33, at three-day intervals, and three applications of kerosene emulsion at 1 in 11, at three-day intervals, could be applied safely to the foliage of citrus, peach, and rose, and to the foliage, flowers, and fruit of the grape.

With tomatoes, it is suggested that two applications of kerosene emulsion at a dilution of 1 in 33 can be applied safely at intervals of three days under normal weather conditions, and in cool weather further applications at similar intervals may be safe. In the tests with tomatoes no burning occurred until the third application of kerosene emulsion at a dilution of 1 in 33, although the first application at 1 in 11 caused slight foliage burn, but in both cases in which burn occurred high temperatures prevailed.

One application of lime-sulphur combined with nicotine sulphate and emulsified oil (A) caused serious burning and defoliation of peaches, but did not injure citrus or apples.

None of the dusts caused any noticeable injury in field tests.

Summary and Recommendations.

Kerosene emulsion at various strengths ranging from 1 in 11 to 1 in 100 proved most effective in destroying thrips.

The control obtained with nicotine sulphate at various dilutions was most unsatisfactory.

The commonly-recommended combination of nicotine sulphate and miscible white oil did not give sufficient control.

Miscible white oil alone, even at high concentration, killed only about half the thrips sprayed.

Benzol emulsion was not as effective as kerosene emulsion at the same dilutions and caused burning to various kinds of foliage.

Some oils which were emulsified with soap prior to spraying gave a satisfactory kill, but had other undesirable properties.

Lime-sulphur alone, Bordeaux mixture alone, and each in combination with nicotine sulphate, were not very effective; but lime-sulphur (1 in 25), combined with nicotine sulphate (1 in 600), and an emulsified oil gave a very satisfactory kill of thrips, but burnt peach foliage. Further tests with this spray combination, using a greater dilution of the oil, may eliminate burning.

A strong soap solution gave a more satisfactory kill than most of the standard liquid contact insecticides.

Of the dusts tested, a pyrethrum dust and a proprietary dust gave a satisfactory kill of thrips under laboratory conditions, and did not cause any burning of foliage in field tests.

In field spraying with a power pump, large numbers of the thrips would be blown mechanically out of the blossoms, and as some of the dusts

appeared to act as repellents for at least twenty-four hours, the treatment would have some value in addition to the actual toxicity of the spray or dust.

In laboratory tests all the thrips can be reached with the spray, whereas in the field large numbers of the pest shelter beneath leaves and within partly-opened blossoms, so that no matter how toxic the spray it cannot be expected to destroy all the thrips.

The greatest problem during the recent plague was to prevent reinfestation of the blossoms. We have demonstrated that certain sprays are quite effective in destroying the thrips in the flowers, but the most toxic sprays used in the experiments had little or no repellent value.

As practically all weeds and native vegetation in the vicinity of orchards were infested by the pest, the blossoms were soon reinfested, and the value of the spray almost nullified.

In conclusion, until further experiments can be carried out, kerosene emulsion at a dilution of 1 in 33 can be recommended as the best general spray for the control of thrips. This should be applied just before any of the flower buds have opened, and at intervals throughout the blossoming period. Under some conditions it may be advantageous to use, instead of the kerosene emulsion, certain dusts mentioned in the table of results.

Modification of Swine Fever Regulations.

Owing to continued freedom from swine fever it has been found possible to modify the control exercised in County Cumberland, and permits will no longer be required for pigs moving into that county or moving within it. Permits will still be required for the movement of pigs out of the county, as the county has been declared to be a quarantine on account of the presence of contagious pneumonia and necrotic enteritis. The movement of pigs out of the county will be limited to stud pigs and to pigs consigned to a registered slaughterhouse for immediate slaughter or to a saleyard for sale for immediate slaughter. If any pigs are removed from Homebush Abattoirs to any registered slaughterhouse they must be slaughtered at such slaughterhouse and not moved elsewhere—Max Henry, Chief Veterinary Surgeon.

Merino Ewes Mate Readily at any Time.

Breeding trials recently concluded at Bathurst with Merino ewes and Dorset Horn and Ryeland rams have proved definitely that Merino ewes will mate readily during any month of the year in that district, and that the two breeds of rams used can also be used successfully during each month of the year. Owing to the importance of early mating in certain fat-lamb raising districts in order to avoid the grass seed nuisance, these results are valuable, although, as Mr. E. A. Elliott, Sheep and Wool Expert, points out, the results would not necessarily apply in hotter districts, particularly if the season was unusually hot.

Orchard Notes.

MARCH.

C. G. SAVAGE and R. J. BENTON.

AT this period of the year the demands made on the soil by fruit trees are rapidly becoming less heavy. The necessity for moisture conservation is not so great, for in most districts rain is generally received during the autumn months. Sufficient moisture, however, must be retained where required for the best development of late ripening varieties, as well as for the germination and growth of green manure crops. Eradication of weed growth and irrigating may be necessary to ensure success with the latter.

Green Manuring.

The maintenance of sufficient organic matter in the soil for future requirements should now receive consideration. Organic matter incorporated with the soil improves its mechanical condition, makes it easier to work, increases the fertility by supplying food for bacterial activity and assists in the regulation of moisture supply. The growing of crops for the purpose of adding as much organic matter as possible is therefore desirable in all soils, particularly in the case of those of a very sandy or heavy clay nature.

Green manure crops are rather costly to sow, especially when production returns are low, but if provision can be made for the sowing of tick beans on inland soils the practice is recommended. The purple vetch is also a heavy yielder on these soils, but is not so readily ploughed in and is more costly to plant. Its use in a rotation with tick beans is sometimes advisable. In coastal areas, where soils are light and several feet in depth, New Zealand blue lupins and purple vetch have for several years proved the most reliable in making heavy growth, even under excessive rainfall conditions. The latter factor has repeatedly spoilt field peas under similar conditions. The usual rate for sowing lupins and tick beans is 1 bushel per acre, whilst vetches are sown at the rate of 20 lb. if broadcast, or 10 lb. if drilled.

If green crops are not being specially sown, weed growth should be encouraged in order to furnish organic matter. Continuous clean cultivation is depleting many soils of fertility, resulting in diminished crops and the production of small-sized fruit.

To grow green manure crops satisfactorily an application of 1 cwt. superphosphate per acre should be applied, and where weeds are being utilised ½ cwt. sulphate of ammonia per acre should be applied in addition to the superphosphate.

Preparations for Planting.

Although the indications are that there will not be much extension in the area under fruit this year, it is seasonable to remind intending growers that any land they propose to plant during the winter or spring should be

prepared as thoroughly as possible. A deep ploughing now will permit rain to soak well in, tend to sweeten the soil, and will greatly facilitate preparation later on.

In localities not subject to severe winter frosts, citrus trees may be planted now. Trees so planted develop more rapidly than those planted in the spring, especially where the spring rainfall is light.

Pest and Disease Control.

Citrus trees can still be treated for any pests that may be present. The red scale is most general, but in some instances brown scale may be present. The latter is usually at a very vulnerable stage of development during March, and spraying with white and red oil should not be delayed. Fumigation is more effective than spraying, particularly where densely foliaged trees require treatment.

In many coastal localities a very weak-growing fungus is noticeable on fruit maturing later. Such is often called sooty blotch; it is not due to the presence of insect pests and is distinct from "fumagine." A spraying with Bordeaux (6-4-100) applied during March or April will prevent the development of this fungus.

Re-work Unsuitable Citrus Varieties.

This is the most suitable period of the year in which to re-work, by budding, unsatisfactory citrus varieties. It is essential that greater uniformity be attained in the types of oranges offered to consumers. Mostly the variation is due to inferior strains of trees.

Where the trees were prepared in the spring by severely cutting back, the strong growths which were thinned out during the early summer will now be in excellent condition to receive the buds. The bud-wood used should be obtained only from trees of proved quality and production.

About two or three weeks after budding, according to the development of the shoots budded on to, the ties should be loosened, and where misses occur they may be re-budded immediately on a new area on the same growth. As a rule citrus buds are less likely to be blown off during their development in spring if they are placed on the inside of the selected shoots now.

Fertilisers for Bananas.

A more general adoption of the practice of using fertilisers in banana plantations is urged by Mr. H. W. Eastwood, Fruit Instructor and Banana Inspector, at Murwillumbah. Even where banana-growers are using fertilisers, they are applying only minimum quantities in many instances. Mr. Eastwood considers that every grower should map out a programme of manuring that will at least return to the soil the quantities of plant foods—nitrogen, phosphoric acid, and potash—his crop removes each year.

Soil fertility is vital to the longevity of a plantation and to the many factors which go to make up quantity, quality, and size of fruit. To ensure fertility fertilisers are necessary, except perhaps on naturally rich soils,

such as virgin scrub land, deep volcanic soils, or renovated lantana ground. Even on virgin land bananas can only be grown profitably for a limited number of years without fertiliser, and while it may be economical for the individual to replant new land when a plantation becomes unprofitable, the general adoption of this practice would prove most harmful to the industry as a whole and tend to encourage growers to disregard fertilising altogether.

Diseases Encouraged by Impoverished Soil Conditions.

The poorer soils require enriching regularly and systematically, and it is essential in the case of old cane land or any land in an impoverished condition to use fertilisers freely in order to ensure satisfactory results. Generally the necessity for using fertilisers is not realised until the soil has become partially exhausted and various kinds of production troubles and diseases make their appearance.

The following fertiliser mixtures are recommended, the quantities shown being sufficient for a stool. Two applications a year should be given, one in August and the other in December or January. The fertilisers should be well distributed and thoroughly worked into the soil around the stools:—

Mixture A.

Blood and bone, 1 lb.
Sulphate of ammonia, 1½ lb.
Superphosphate, ¾ lb.
Sulphate of potash, 1 lb.

Mixture B.

Dried blood, 1¼ lb.
Sulphate of ammonia, ¾ lb.
Superphosphate, 1½ lb.
Sulphate of potash, 1 lb.

Best Fertiliser for Potatoes at Windsor.

Further proof of the correctness of the Department's fertiliser recommendation for potatoes in the Windsor district was supplied by the results of a trial supervised by Mr. John Douglass, Agricultural Instructor, on the property of Messrs. May Bros., Pitt Town Bottoms, last season. Superphosphate, 2½ cwt. per acre, proved to be the most profitable fertiliser to use, giving the same yield increase as 5 cwt. superphosphate and outyielding all other fertilisers tested.

A fertiliser trial was also carried out in co-operation with Mr. J. Gardener, Cornwallis, but owing to lateness of planting, the results are not strictly comparable with those of previous trials.

The yields obtained in these trials were:—

	Superphosphate. 5 cwt. per acre.	Superphosphate. 2½ cwt. per acre.	P12 Fertiliser, 327 lb. per acre.	P11 Fertiliser, 327 lb. per acre.	M22 Fertiliser, 2½ cwt. per acre.	No Manure.
	t. cwt. q.	t. cwt. q.	t. cwt. q.	t. cwt. q.	t. cwt. q.	t. cwt. q.
May Bros. ...	9 13 0	9 13 0	9 11 2	9 7 0	8 2 1	7 17 2
J. Gardener ...	6 11 2	6 12 2	6 18 3	8 10 0	7 2 2	6 16 1

Note.—P12 fertiliser mixture comprises 6 parts superphosphate and 1 part sulphate of potash; P11 mixture, 6 parts superphosphate and 1 part sulphate of ammonia; M22 mixture, equal parts of superphosphate and bonedust.

Unit Values of Fertilising Materials, 1932.

The unit values of fertilising ingredients in different manures for 1932 are as follows:—

	Per Unit.	
Nitrogen in nitrates...	22	8
„ ammonium salts	12	3
„ blood, bones, offal, &c.	13	3
Phosphoric acid in bones, offal, &c	4	9
„ (water soluble) in superphosphate	4	7
Potash in sulphate of potash	8	6

To determine the value of any manure, the percentage of each ingredient is multiplied by the unit value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, bonedust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4 × 13s. 3d. = £2 13s. 0d. = value of the nitrogen per ton.
20 × 4s. 9d. = £4 15s. 0d. = „ „ phosphoric acid per ton.

£7 8s. 0d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time it has been attempted to make the standard indicate as nearly as possible the fair retail value of the manurial ingredients, and it will be found in the majority of cases the price asked and the value assigned are fairly close.

It will be noted that the unit values of nitrogen in ammonium salts and in bones, &c., as well as that of phosphoric acid in superphosphate and in bone manures show a decrease compared with unit values obtaining in 1931.

Compared with 1931 prices the unit value of nitrogen in nitrates increased 19 per cent., the unit value of nitrogen in ammonium salts decreased 12 per cent. and in bone manures, &c., 15.4 per cent.

The unit value of phosphoric acid in superphosphate decreased 3.5 per cent., while the value of phosphoric acid in bone products, &c., decreased 9.5 per cent.

The price of nitrogen in bones, &c., is 1s. per unit (8.2 per cent.) more than in ammonium salts and the price of the phosphoric acid 2d. (3.6 per cent.) higher than in superphosphate.

The unit value of potash in sulphate of potash advanced 27½ per cent. on 1931 values.

It should be noted that as sulphate of potash is imported from overseas the local price will depend on a number of factors, but principally on rate of exchange between Australia and London and between London and Continental cities, and on the value of sterling.—A. A. Ramsay, Chief Chemist.

Unquestionably it will take more labour to produce fifty bushels from an acre than it will to produce ten bushels from the same acre; but will it take more labour to produce fifty bushels from one acre than from five?

Poultry Notes.

March.

E. HADLINGTON, Poultry Expert.

During this month it is not too early to start making preparations for the coming breeding season, as time soon passes and often this important work is left until late in the season, causing a rush of work at that time. In the first place the pens should be put in order where necessary, and if they are not already empty and spelling no time should be lost in clearing them out, giving them a good cleaning and spraying, so that they can be left to the sterilising effect of the elements to freshen them up before the breeding stock are put in.

If cockerels are being saved from which to choose breeders, a further selection can probably be made to cull out those which are not coming up to expectations. This is where many make the mistake of retaining showy little birds, which perhaps have a fiery eye and look attractive at the present stage—also, being the bosses of the yard, they are regarded as vigorous birds suitable for breeders—but these are the precocious sorts which should not be kept, as they are almost fully matured and will not develop much more in size, consequently they will not make desirable breeders. From such birds there is a tendency to produce a high percentage of quick-maturing progeny, which come into production too early and have not the stamina to stand up to the strain of heavy production; moreover, what is worse still, they are responsible for many of the small eggs produced.

The best class of cockerels to retain are those which are now somewhat "raw" in appearance but large in frame. These, when mature, will fill out and make robust birds to breed from.

Introduction of New Blood.

Those who intend to purchase birds for the purpose of infusing new blood into their flocks should look around for their requirements so that a good selection can be made. To leave purchases till later on lessens the chances of securing the right class of birds.

On the question of the introduction of new birds there is much diversity of opinion and many breeders are afraid that by bringing in new blood they may suffer loss in production, but it would be better for the industry if more commercial poultry farmers made a practice of outcrossing rather than breeding too closely with their own strains, which can only lead to weakness. This is not always manifest in the rate of production at first, but continued close breeding is undoubtedly responsible for the lowering of resistance to disease, a higher rate of mortality among chickens and loss of size in eggs, and while these troubles may not be immediately evident, there

is no escape from such evils if the practice is persisted in, and the more artificial the conditions the quicker will disaster come. Careful selection and good conditions of rearing will prolong the inevitable result, and these factors make it possible for some breeders to carry on for long periods without introduction of fresh blood, but there is sufficient evidence on many farms of the ill effects of indiscriminate breeding, while experiments carried out in other parts of the world have also proved the unsoundness of continued close breeding.

The main considerations in introducing new blood into the breeding pens are to choose birds of a similar type to those with which they are to be mated, avoiding any evidence of coarseness, while at the same time paying particular attention to robust health and physique, and if a pedigree for high production can be combined so much the better, but the other points mentioned should not be sacrificed for any pedigree. Breeders who have not sufficient confidence in their ability to select the right class of birds would do well to try out the matings before introducing the new blood into their flocks, and for this purpose a male bird or two might be purchased every year or so.

What should be realised is that bad as well as good qualities are perpetuated by inbreeding, and, therefore, without an innate knowledge of breeding, combined with keen observation, there is a greater risk of deterioration than by outcrossing.

Sex Linkage.

The question of the practical application of sex linkage to commercial poultry farming in this country has recently been raised. What is meant by sex linkage is the mating together of two breeds of certain colours to produce progeny, the sex of which can be distinguished by their colour markings at hatching time. For instance, in mating a cockerel with gold or red feathering with hens of silver colouring the pullet chickens will have gold and the cockerels silver markings. Knowledge of this subject is not new, as the discovery was made many years ago, but in recent years greater prominence has been given to the matter by different writers, chief of whom is Professor Punnett, and judging by the publicity given to the subject one would form the opinion that the idea had been adopted extensively in England, but from my own observation and inquiries while in that country I came to the conclusion that only comparatively few commercial poultry farmers had taken up the breeding of sex-linked chickens. As a matter of fact, I only came across one farm during my travels where the system was being practised, and then only to a limited extent.

Nor is the idea likely to become universally popular owing to the fact that two pure breeds have to be kept to cross for the production of the sex-linked progeny, and breeders of these crosses if selling the sex-linked chickens would have most of the cockerel chicks left on their hands, which would necessitate charging a much higher price for the pullet chicks. Again, the limited choice of commercial breeds which could be crossed for

egg production is another factor which has to be taken into consideration. Chiefly breeds having definite gold or silver markings and only certain blacks can be utilised, therefore the main breeds which could be used are:—

Silver Markings.—Barred Plymouth Rocks, Silver Wyandottes, Columbian Wyandottes, Light Sussex, Silver Campines, Anconas and Duckwing and Exchequer Leghorns.

Gold Markings.—Rhode Island Reds, Red Sussex, Brown Leghorns, Gold and Partridge Wyandottes and Gold Campines.

So far as is known Langshans and Black Leghorns are the only black breeds which will produce sex-linked chickens, and then only when mated with Plymouth Rocks.

Limitations of Sex Linkage in Australia.

Those who would advocate sex-linkage breeding in this country should first visualise what it would mean. In the first place the two main breeds, White Leghorns and Black Orpingtons, which comprise probably 95 per cent. of the birds on commercial poultry farms, could not, as far as is known at present, be employed in breeding sex-linked chickens. This would leave only a few commercial breeds from which to make a choice for such crossing, and what poultry farmer would choose crosses of these breeds in preference to the two proven pure breeds which are the mainstay of the industry?

Another point is that any hatchery catering for this trade would have to keep large numbers of certain breeds which are not now looked upon favourably by commercial poultry farmers and which, in the light of present knowledge, do not pay as well as the two main breeds mentioned. The important matter of risking the purity of breeds should also be kept in mind, and in this connection the opinion of that eminent English authority, Sir Edward Brown, should carry some weight. He says: "Sex-linkage implies crossing. Its chief danger is in sacrificing the purity of breeds, even though pure-bred stock are necessary for its success, which has been the foundation of progressive poultry husbandry in all countries, following upon the teachings of nature. The breeding value of the birds thus crossed is lost, and the absence of uniformity in colour in itself is an important factor. . . . As a general question it is scarcely to be expected that a system which necessitates the killing as soon as hatched of half the chickens thus brought out, and losing all potential values, and that disregards the breeding values of the more prolific hens, is likely to commend itself to those engaged in this branch of food production. Further, it would involve elimination of all the pure white and many of the black-plumaged races, which comprise some of the most prolific of all fowls. These self-colour breeds have much to recommend them in that there are no complex colour complications."

In conclusion, I would point out that there is already evidence of impurity in many strains of our birds, and it is certain that if sex-linked breeding were indulged in to any extent this evil would be greatly increased, merely to save the work of raising the cockerels, which, if handled properly, could be made to pay for rearing, particularly in the heavy breeds, while in the light breeds the cockerels can mostly be detected at a very early age—up to which time the cost of rearing has been negligible—and they can be killed if desired.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1931:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ..	206,985	106,065
Tomatoes ...	176,166	...
Bananas	105,012	...
	bunches.	
,, ...	2,005	...
	cases.	
Pineapples ...	55,691	...
Melons	585	...
	tons.	
,, ..	234	...
	doz	
,, ...	370	...
	lb.	lb.
Canned Fruit ..	115,976	237,440
Dried Fruits—		
Unspecified ...	21,308	224
Currants ..	6,636	56
Raisins ..	7,448	56
Apricots ...	1,120	...
Apples ...	1,456	...
Peaches ..	1,512	...
Pears	616	...
Prunes ...	1,960	4,088

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	425
Bananas ...	....	1,887	...
Lemons ...	....	...	2,499
Oranges ..	....	41	44,376
Grape Fruit ...	....	90	..
Pears	....	...	29
Pineapples ...	....	...	2,694
Other	....	352	5,537
Dried Fruits—		lb.	lb.
Apples ...	....	...	2,466
Apricots ...	....	...	84
Currants ..	....	...	6,000
Figs	Syria	104	...
,, ...	Turkey	78,880	...
,, ...	United States .	14,375	...
Peaches ..	....	...	708
Prunes ...	....	...	183,536
Raisins—			
Sultanas ..	....	...	9,976
Lexias ...	....	...	56
Other ..	....	...	21,961
Dates	....	...	11,589
,, ...	Arabia	6,800	...
,, ...	Mesopotamia ...	2,296,889	...
,, ...	Persia	6,753	..
,, ...	Turkey	21,620	...
Other	China	2,187	2,929
Preserved in liquid—			
Apricots ...	....	...	428,282
Peaches ...	....	...	1,419,740
Pears ..	....	...	10,747
Pineapples ...	....	...	2,046
Raspberries	....	...	21,783
		Gallons.	
Other ...	....	2,209	21,082

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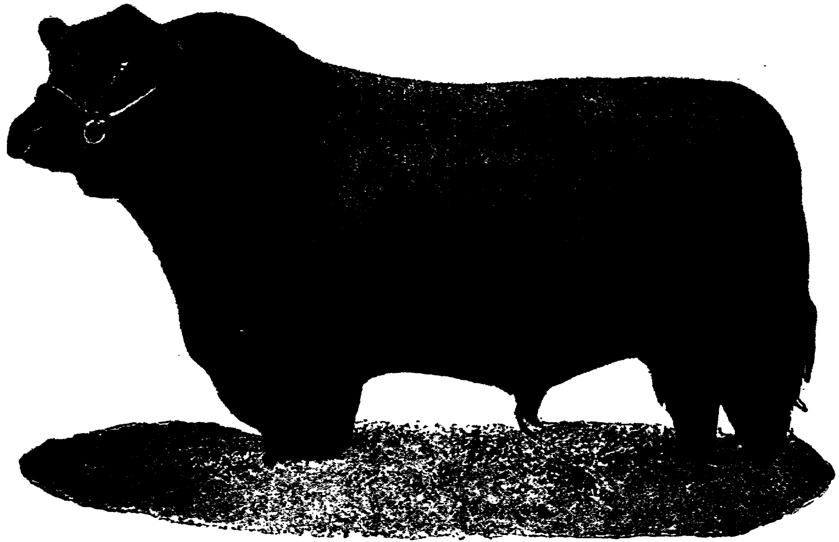

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Tomato Seed Production.

A COMMERCIAL PROPOSITION FOR NEW SOUTH WALES GROWERS.

JOHN DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

A GOOD deal of publicity has been given recently to the fact that we import into this country vegetable seed to the value of £75,000 annually. Interested people still argue as to the suitability of locally-raised seed, despite the fact that departmental experiments have conclusively proved that local seed, if selected on correct lines, is in every way superior to the imported article. It is not intended here to enlarge upon the aspect of the subject, it being sufficient to state that the most progressive growers of all classes of vegetables use locally-saved seed.

It has been claimed that this country is not suitable for the growing of vegetable seed on a commercial scale. Actually the whole of the seed of certain crops has been produced here for many years, while commercial crops of vegetable seed of all descriptions have been successfully grown at one time or another. The greatest factor operating against the commercial production of the whole of our seed requirements locally is the matter of cost. It is possible for seed merchants to import seed that as far as price is concerned is so low that we could not under any circumstances hope to compete against it. On the other hand, there are several points in favour of local seed production. In the first place, we are able to check up on the purity and freedom from disease of our own seed. Moreover, the varieties selected need only be those that have proved to be suitable to local conditions and by adopting a proper programme of selection work we should be able to improve the varieties grown. Another very important point is that the germination of local seed is invariably better than that of the imported article.

Method of Saving Tomato Seed.

Although practically the whole of the tomato seed sold in this State is imported, it is only a very small percentage of the most progressive growers who do not save their own seed requirements. There is a good deal of difficulty in the saving of tomato seed for the average grower, as he will not go to the trouble of spending sufficient time on the job to attend to details.

For a number of years tomato seed has been saved on a fairly extensive scale at Bathurst Experiment Farm, and although every tomato experimenter of my acquaintance saves seed for his own requirements, only one or two have ever attempted to save seed on a commercial scale. In testing out the possibilities of tomato seed production on a commercial scale the Department enlisted the co-operation of Mr. Albert Sorby, of Macquarie Fields, who is one of the most progressive tomato growers in the State. Mr. Sorby's specialty is the early staked crop and the variety he

grows is Sunnybrook Earliana, which has proved to be the most suitable variety over a number of years. This selection is greatly superior in many ways to the old type of Earliana, being a more persistent yielder and of better shape and quality.

The crop sown for commercial seed production was from seed selected from individual plants. The resultant crop was very uniform in type and there was a heavy setting of fruit, the commercial yield being over 1,600 cases per acre. All diseased plants were cut out of the crop before the seed plants were selected. Only well-matured fruit was harvested, although over-mature fruit was included. On the whole, the fruit was perfect in shape and size and would have graded 90 per cent. first class over 2½ inch. fruit.

Separating the Seed from the Pulp.

The fruit was brought to a central shed where it was cut in halves on the flat, the seed and juice being squeezed out into a container. The flesh and skins could be used for condiment making if desired. At the end of each day the seeds and juice were mixed in a barrel placed in a warm position. Under no circumstances should water be added to the mixture, as it encourages early germination of the seed. The mixture was kept constantly stirred, as it was found that certain light material which floated fermented quicker than the general mass, thus producing an uneven fermentation. Tomato seed is surrounded with a hairy coat, which must be free of flesh to ensure perfect germination, and the object of the fermentation is to separate the gelatinous flesh from the seed proper. This flesh, if allowed to remain on the seed, is likely to ferment and adversely affect the germination of the seed; or, on the other hand, it may dry into a very hard substance that would retard germination.

Fruit Suitable for Seed.

Several large batches of tomato seed were fermented during the tests, it being considered that fermentation was completed when the flesh came away freely from the seed. It might be mentioned here that if the seed is allowed to remain in the liquid too long it will start to germinate and thus be destroyed. Under good, fine, summer conditions it was found that the

average time taken for seed to ferment sufficiently was forty-eight hours. Temperature is the controlling factor in the time taken to bring about fermentation. It was found that a cold night checked the development of yeasts and moulds, and in such cases fermentation might take as long as seventy-two hours. After the first batch of seed was fermented it was found that if a few gallons of the strained juice of a completed batch were mixed with the fresh solution of the following batch the fresh solution was, as a result, inoculated with live organisms, which hastened fermentation.

The next step in the preparation of the seed was to strain the whole batch through a fine gauze sieve. This allowed any small seeds and rubbish to escape, while the plumper seed and larger fibres remained. The latter (seeds and fibre) was then vigorously worked around the sieve with the

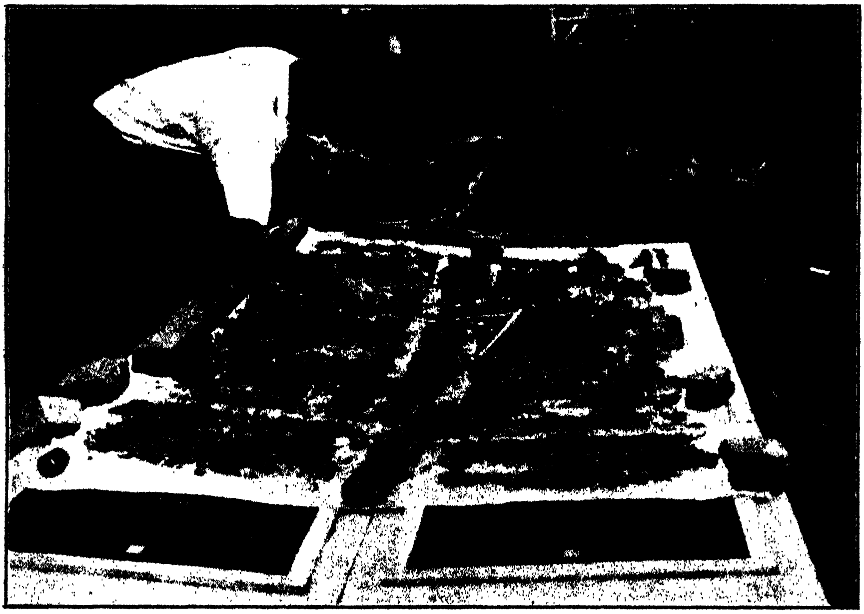
Outfit for Separating Seed from Pulp.

hand, the object being to break down any small clusters of seed. After this treatment the material was placed in clean buckets and washed in clear water. After thoroughly agitating, the seed settled down to the bottom of the bucket, while the fibre, &c., floated. The water was then poured off, taking with it the major portion of the rubbish. This process was repeated until finally the solution was quite clear. The seed was then taken out of the water, screwed up in a cloth to free it of surplus water, and then spread out in the sun to dry.

Several other means of saving the seed were tested. The greatest difficulty was to ensure an even fermentation, while it was also found difficult to get rid of the skins unless halving and hand-squeezing were resorted to as in the method described above.

Working Costs.

On the whole over 200 half-bushel cases of tomatoes were treated. An accurate account was kept of 120 cases treated as outlined. These 120 cases yielded 96 gallons of seed and juice, which, when fermented and cleaned, produced 165 ounces of commercial seed. This yield was considered high, averaging 1 lb. seed from slightly less than twelve cases of fruit. It should be remembered, however, that the Earliana variety, particularly in the summer months, is very rich in seed. It was estimated that one man and a boy could harvest 250 cases of tomatoes in a day, while the same amount of labour would be required to cut up and extract about fifty cases per day.



Drying the Seed.

The matter of cleaning and drying the seed would not be at all expensive if good weather was experienced. The tomatoes at mid-summer were valued at 2s. per case, although when some of Mr. Sorby's seed was selected the fruit was valued at 7s. per case. However, if one is going to grow tomatoes for a seed crop it will not be necessary to go to the same trouble as with the early staked crop, although strict attention will have to be given to roguing.

Cost of Treating Fifty Cases.

	£	s.	d.
Cost of pulling fifty cases of tomatoes	0	3	5
Cost of cutting and processing fifty cases	0	17	0
Cost of fifty cases at 2s. each	5	0	0
Total	£6	0	5

Fifty cases of tomatoes would yield 68¾ oz. of seed. Thus the cost of producing an ounce of seed under the conditions set out above would be approximately 1s. 9d. Labour was estimated at 12s. per day for the man and 5s. for the boy when working out the above costs.

The results of this test clearly indicate that it is economically possible for farmers in this State to produce the whole of our tomato seed requirements. While it is admitted that the price given for the tomatoes is low, this will, to a certain extent, be counterbalanced by improved methods of handling the crop. No machinery was used in the tests, although there is plenty of scope for its utilisation. The sample of seed produced was perfect in every respect, being plump, uniform in size, of an excellent colour and quite free from stains. While the Seeds Act of the State only requires seed of tomatoes to test 60 per cent. germination, Mr. Sorby's seed tested 93 per cent. His entire crop of early tomatoes yielded over 1,600 cases per acre. If the whole of the fruit had been saved for seed it is estimated that 2,200 oz. of seed would have been produced.

Wheat Prices on Sydney Market, 1890 to 1931.

The following table, showing the average prices of wheat for February and March of each year and also the average yearly price since 1890, was compiled from figures obtained from the Government Statistician:—

Year.	February.	March.	Average Price for Year.	Year.	February.	March.	Average Price for Year.
	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.
1890 ...	3 6	3 6	3 7¼	1911 ...	3 7¾	3 5	3 6
1891 ...	3 7½	3 10	4 3	1912 ...	3 9¼	3 8½	4 1
1892 ...	4 9	4 9	4 8½	1913 ...	3 6½	3 7	3 2¼
1893 ...	3 6½	3 6	3 6½	1914 ...	3 8	3 9½	4 1½
1894 ...	2 11	2 8	2 9½	1915 ...	5 6	5 6	5 5
1895 ...	2 7	2 7	3 4	1916 ...	5 1¾	5 0¾	4 10
1896 ...	4 4½	4 5	4 3¼	1917 ...	4 9	4 9	4 9
1897 ...	4 8	4 6½	4 5¾	1918 ...	4 9	4 9	4 9
1898 ...	4 0	4 0	3 8	1919 ...	5 0	5 0	5 1½
1899 ...	2 7½	2 9	2 9	1920 ...	8 5	8 10	8 7¼
1900 ...	2 9	2 8	2 8½	1921 ...	9 0	9 0	8 8
1901 ...	2 7	2 7	2 8	1922 ...	5 2	5 11	5 8
1902 ...	3 2	3 2¾	4 5	1923 ...	5 8	5 7	5 3½
1903 ...	5 11⅝	5 9¼	5 1¾	1924 ...	4 7	4 7	5 5
1904 ...	3 0½	3 0¾	3 2	1925 ...	6 9½	6 4	6 2¼
1905 ...	3 4½	3 3⅜	3 5	1926 ...	6 0	5 9	6 2
1906 ...	3 1⅝	3 2¼	3 3½	1927 ...	5 1½	5 0¾	5 5
1907 ...	3 0⅞	3 1½	3 10	1928 ...	5 2	5 5	5 1¼
1908 ...	4 4	4 5½	4 3½	1929 ...	4 8	4 8	4 6¼
1909 ...	4 0¾	4 6½	4 9	1930 ...	4 8½	4 5	3 10¼
1910 ...	4 1¾	4 1	3 10	1931 ...	2 1¾	2 1¾	*2 4½

* To November.

Superiority of Factor Potatoes for Coastal Conditions.

Messrs. May Bros., Pitt Town Bottoms, and John Gardener, Cornwallis, co-operated with the Department in carrying out potato variety and strain trials last season, the seed for the trials being donated by leading tableland growers.

The results were as follows:—

Variety and Strain.	May Bros.	John Gardener.
	t. cwt. qr.	t. cwt. qr.
Factors (McPaul)...	10 17 3	9 8 3
,, (A. G. Kingham)	10 13 0	7 13 3
,, (Batlow Packing House)	....	8 7 3
,, (Howard)	9 13 0	....
,, (O. Frost)	7 3 3	6 8 3
,, (I. Moad)	8 0 2	....
,, (Frost Bros.)	....	6 7 3
,, (J. Flood)	8 0 3	....
Gold Coin ...	8 9 3	7 5 0
Alpine Wonder ...	3 9 2	8 8 3
Satisfaction (Howard) ...	8 9 3	....
Early Manhattan (I. Moad)	7 17 3	3 10 0
,, ,, (C. Oats)	7 16 0	6 9 3
,, ,, (P. A. Oldham)	9 5 2	....
,, ,, (F. H. Kingham)	5 18 0	....
,, ,, (T. Oldham) ...	....	6 10 3
White Manhattan	5 9 0	....
Early Rose	....	4 6 1

McPaul's strain of Factor did best in both trials, and there is no denying the superiority of the best strains of this variety for coastal areas. The lower yields obtained at Cornwallis were due to unavoidable late planting.

That Manhattan variety cannot compare with the best strains of Factor under coastal conditions was again demonstrated, and, although one strain of Early Manhattan yielded over 9 tons per acre, it must be remembered that this variety brings more than £1 per ton less than Factors. Gold Coin, a very early-maturing whiteskin variety, did well in both trials, and there should be a place for it in coastal areas when it is further selected for freedom from virus diseases.

A number of unofficial variety trials were also conducted last season, the chief point of interest being the favourable showing of the Western Australian variety Delaware. It was freer from virus infection than many strains of Factor. It is a whiteskin variety with deep clear-cut and numerous eyes, while the appearance of the bagged tubers is excellent. The eating quality, however, is only fair.—John Douglas, Agricultural Instructor.

New Dates of World's Grain Exhibition, Canada.

July 24th to August 5th, 1933, are the dates now fixed for the holding of the World's Grain Exhibition and Conference at Regina, Canada.

Capsicum or Pepper Varieties.

W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeder.

CAPSICUMS or peppers, which are probably better, though not so accurately, known as chillies in Australia, belong to the species *Capsicum annuum*. This genus is a member of the solanaceae, to which family potatoes and tomatoes belong. The crop requires a long warm growing season, such as is obtained on the North Coast, for the best results.

A large number of varieties of different type and quality exists, and since many of these are catalogued by local seedsmen, and some are grown commercilly, a classification of these varieties according to their type or use is given herein.

All varieties of capsicum have a more or less pungent taste, due to the contained principle, capsaicin. The amount and distribution of this principle in the fruit divides the peppers into two distinct groups—(*a*) sweet or mild peppers, and (*b*) hot or pungent peppers. In the case of the mild peppers the principle, capsaicin, is confined mainly to the seeds and to the placenta on which they are borne. The flesh of the fruit is almost entirely free from it. The hot peppers, on the other hand, have considerable amounts of capsaicin in the flesh, as well as in the seeds of the fruit, the pungency depending on the amount of the principle present. Cayenne or red-pepper is obtained by grinding the whole of the fruit to a fine powder.

Non-pungent or Sweet Peppers.

1. *Bell Group.*—This group is characterised by very large, irregular oblong-shaped fruit that is more or less deeply lobed with thick flesh of very mild flavour. This group is largely used for salads, and for baking and stuffing.

(*a*) *Red Varieties.*—Bell, Bullnose, Elephant Trunk, Chinese Giant, Ruby King, Ruby Giant, Harris Early Giant, Sweet Mountain, Sweet Spanish.

(*b*) *Yellow Varieties.*—Golden Queen, Oskosh.

2. *Pimiento Group.*—This group consists of a number of mild, thick-fleshed, medium-sized peppers of rounded and pointed shape, having a smooth outline; in some cases definitely peg-shaped. Used in America for canning and for salads.

Only one variety is catalogued locally, namely, Sweet Genoa. Perfection is one of the chief varieties grown in America. The varieties Stark's Giant, Pimiento, and Harris Earliest are also of this group.

3. *Tomato Group.*—This group has fruit broader than long and oblate, having a characteristic tomato shape. It includes the varieties Tomato and Topepo or Pepeto, which are used in the same way as those of the Pimiento group.

Hot or Pungent Peppers.

4. *Large Chilli Group.*—Long, slender, thin-fleshed fruits of either mild or strongly pungent flavour.

(*a*) The mild varieties are mostly used in a dry state for flavouring other foods. Large Red is the only variety listed by local seedsmen. American varieties are Mexican, California, and Bolivian.

(*b*) Hot varieties are used by local pickle and condiment manufacturers.

1. *Red Varieties.*—Long Red Cayenne.
2. *Yellow Varieties.*—Long Yellow.

5. *Small Chilli Group.*—Small, oblong, linear, thin-fleshed fruit of strongly pungent flavour. Used by local pickle and condiment manufacturers. The varieties belonging to this group are Small Chilli, Coral Gem, and Tabasco.

6. *Celestial Group.*—Small to medium-sized, conical fruiting, hot varieties. Celestial is the only variety listed locally.

7. *Cherry Group.*—Small, round fruiting, hot varieties. Cherry is the only variety catalogued locally.

8. *Bird's Eye Group.*—This group belongs to the species *C. fructescens*, and is a shrubby perennial. Sometimes grown as an ornamental shrub. Locally listed varieties are Bird's Eye and Creole.

Owing to the fact that some cross-pollination does take place between varieties, occasional plants are found to show characteristics of the mild-flavoured types and yet prove to be quite hot. Such types are, however, rare.

New Zealand Prohibits the Importation of our Grass Seeds.

Owing to the spread of cattle tick in New South Wales, the New Zealand Government has for the time being (until the true situation is definitely known) placed an embargo on the importation from this State of paspalum and other grass seed intended for sowing.

Inoculation for Tick Fever Fraught with Great Danger.

Discussing recently the situation as regards tick fever on the Tweed, Mr. Max Henry (Chief Veterinary Surgeon of the Department) said that whilst the position was still causing anxiety, it was such as to be readily susceptible to control and eradication by regular and widespread dipping. The great danger of the spread of tick fever exists in the possible creation of "carriers," and, as inoculation creates carriers, the suggestion that cattle in New South Wales should be inoculated is one fraught with great danger to hundreds of farmers whose herds are not infected and may never become infected.

Varieties of Oats in New South Wales.

[Continued from page 206.]

ALLAN R. CALLAGHAN, D.Phil., B.Sc. (Oxon), B.Sc.Agr., Assistant Plant Breeder.

IN previous articles of this series Algerian, Belar, Mulga, Guyra, Gidgee, and Lachlan varieties have been dealt with. In each article the varieties are ranged in order of importance.

Sunrise.

Sunrise was the first oat of earlier maturity than Algerian grown in New South Wales. A plant of comparatively early maturity was discovered in a plot of Algerian at Longerenong College, Victoria, by Mr. Pridham in 1910. The progeny of the plant was almost rejected because of its sparse stooling habit, but its uniform early maturity made a very strong appeal, and it was retained, subsequently giving rise to the variety Sunrise. Although apparently fixed, Sunrise later contributed a number of valuable selections. These derivatives, of which Belar, Mulga, Myall, and Buddah are examples, were all early maturing, and together with Sunrise they have been the basis of a marked increase in the popularity of oats among wheat farmers in New South Wales. It is clear, therefore, that the initial selection of the early-maturing plant from Algerian has completely justified itself, in that it represented the beginning of many of our valuable varieties.

Sunrise is still very liable to variation, and several strains grown side by side show remarkable differences in minor characters, but agree in maturity and general agronomic characters. The description given below applies to the line which has been multiplied from the breeding plots at Cowra, and which is known to conform closely to the original type. The dun colour of the palea and the absence of basal hairs are distinctive features of this strain.

The young growth of Sunrise is semi-erect; its tillering is low, with an index of only 2 to 2½. The margins of its medium-narrow leaves are fringed with hairs. The leaf-sheaths are purple tinged. The tall straw is stout and rather coarse, but only medium strong, and is liable to lodge under conditions of excessive growth. A few hairs are present on the nodes, never very abundant, but usually most noticeable just above and below. The straw in the lower and middle internodes develops a purple tinge on maturity.

Sunrise has a large spreading equilateral panicle, of the general pyramidal type; the rachis is erect throughout. (See Fig. 21.) The main branches leave the rachis at angles from 60 to 90 deg., and are only partially drooping. The spikelets are evenly distributed, and, compared with Mulga, are more plentiful in the region of the branch axes. The plump grain is creamy white, or pale yellow with a decidedly dun-coloured palea. A strong

awn is borne by the primary grain only of all spikelets. The basal attachment of the primary grain is partially solidified, and the racnilla character varies between partial articulation and fracture at the base; the secondary grain is never held as loosely as in true *sativa* varieties, and in threshed samples of single panicles both fractured rachillae and those with the knob of articulation are present, generally with a preponderance of the former.

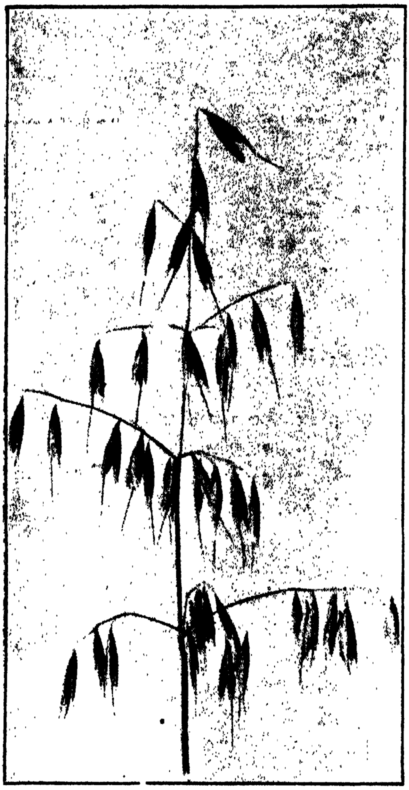


Fig. 21.—Sunrise.
This variety has a large spreading panicle of the pyramidal type with an erect rachis.

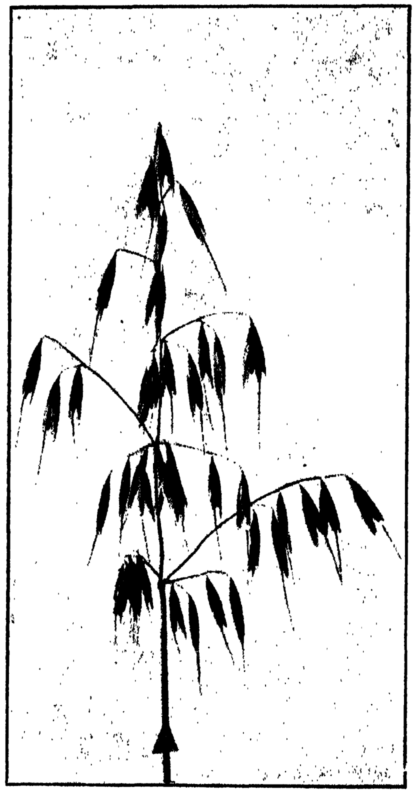


Fig. 22.—Buddah.
Note its general pyramidal shape, the erect rachis, and its axial angles of 45 to 60 deg.

Sunrise is an early-maturing variety best suited to coastal and tableland districts for use as silage or as fodder. Its derivatives, especially Belar and Mulga, are much better suited as dual-purpose oats for western areas. On account of its resistance to crown rust Sunrise is popular on the coast, where it is grown largely for fodder purposes. It is susceptible to stem rust and loose smut.

Buddah.

Buddah was selected from Sunrise as a still earlier-maturing type at Cowra in 1916. Its young growth is very erect, a habit which is accentuated by its very sparse tillering habit of 1½ to 2. The foliage is of medium-width

with pubescent leaf-margins and leaf-sheaths. As the plants mature the leaf-sheaths develop the purple colour typical of the varieties of similar origin. Buddah is more erect in early habit and tillers less than Mulga, otherwise they are very similar.

The straw of Buddah is tall, medium-coarse, of only medium-strength, with slightly hairy nodes, and a purple tinge on maturity. In general appearance it is difficult to distinguish from either Mulga or Myall.

A general similarity in the panicle and grain characters of Buddah Mulga, Myall, and Sunrise exists. The panicle of Sunrise is generally larger with a more even distribution of the spikelets. Buddah has a pyramidal panicle (see Fig. 22), with the tip of the rachis very erect; the branches leave the rachis at a slightly more acute angle (from 45 to 60 deg.) than in either Mulga, Myall or Sunrise, and the branches remain more rigid with very little drooping at the tip.

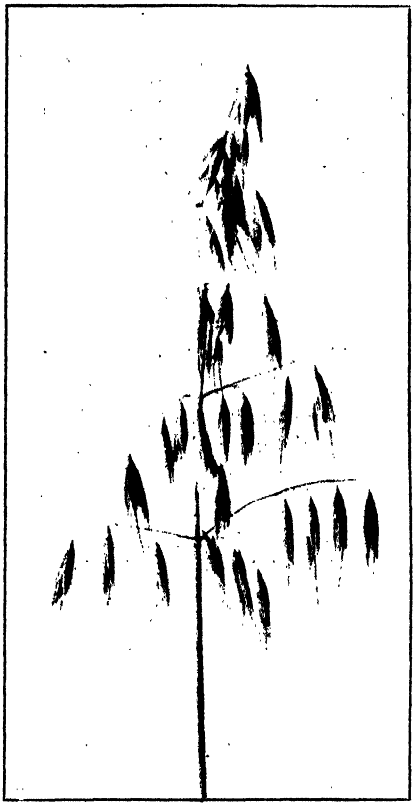


Fig. 23.—Myall.
The panicle of Myall is pyramidal, with erect rachis and medium long branches, which leave the rachis at angles of from 45 to 90 deg.

In general colour Buddah enjoys greater stability than Mulga; the colour is always creamy white. It has not the dun-coloured palea of Sunrise, and the total absence of basal hairs helps to distinguish it from both Mulga and Myall. The base of the primary grain is partially solidified, and although the rachilla usually fractures, partial articulation with the secondary grain is a feature of a few spikelets from the same panicle. A strong awn is borne on the primary grain only of all spikelets.

Sparse stooling and limited bulk under tableland conditions are against Buddah for such districts. On account of its resistance to crown rust and moderate resistance to stem rust it is grown with success in coastal districts. It is susceptible to loose smut.

Myall.

Myall represents another of the derivatives of Sunrise, from which it was selected at Cowra in 1917.

Less erect than either Buddah or Mulga, it has slightly better tillering qualities than either, with an index of three, and more compact growth. The medium-fine leaves are slightly fringed with hairs; these are most noticeable on the lower leaves of the plant. It is tall, with medium-coarse, medium-strong straw, the nodes of which are quite glabrous. A medium-deep to deep purple develops on the straw, especially below the nodes as the plants mature.

In general deportment the panicle of Myall is indistinguishable from that of Mulga. It is pyramidal, with erect rachis, and medium-long branches which make angles of from 60 to 90 deg. with the rachis. The medium-large spikelets are distributed evenly and suspended in pectinate fashion. The panicle of Myall is illustrated in Fig. 23.

As in Mulga the grain is plump and creamy white to light brown; in this regard it enjoys greater stability and seldom shows much variation. A strong awn is present on the primary grain only of all spikelets. A small basal scar on the primary grain is almost invariably accompanied by a few long basal hairs. The rachilla fractures near the tip, and is thus normally retained on the primary grain.

In competition with Mulga, from which it is barely distinguishable, Myall is rapidly disappearing from general cultivation in tableland and western oat growing areas. Its popularity on the coast is due to its moderate resistance to crown rust. In all infection tests so far carried out Myall has proved resistant to loose smut, but it is susceptible to stem rust.

White Tartarian.

White Tartarian was among the earliest oats introduced into New South Wales for trial from England; it is now the only oat of its class grown to any extent in the State. In localities on the Northern Tablelands, where it does well, it is known by various names, the most common of which are White Tartar, Long Sideling, White Oat, Reid, and Reid's New Oat. These may be taken as synonymous, at most representing different strains of White Tartarian.

Of typical semi-erect habit in early growth, White Tartarian tillers abundantly under suitable climatic conditions, but on the basis of head producing tillers its tillering coefficient is seldom better than three to three and a half. The leaves are broad and generally rather coarse with glabrous margins.

As a variety for hay one of the chief objections to White Tartarian is its very coarse straw and flaggy growth. It is very tall and strong, standing particularly well for a side-bearing type. The nodes are prominent and glabrous, and, except for tinges in close proximity to the nodes, the straw develops no purple colouration, ripening off quite yellow.

Unlike any other variety grown in New South Wales, White Tartarian has a condensed unilateral (one-sided) panicle which gives it a decided individuality (see Fig. 24). The rachis leans very noticeably to one side.

The spikelets, although semi-confused around the panicle base, are more pectinate towards the top of the panicle. The spikelets are not very large and usually bear only one or two grains.

Fig. 24.—Panicle of White Tartarian.
The panicle of this variety is unilateral, or one-sided.

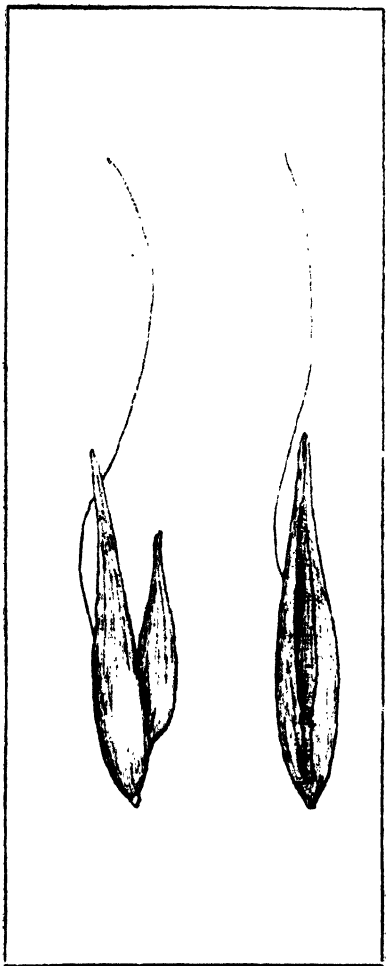


Fig. 25.—Spikelet and Grain of White Tartarian.
Note the solidified base of the primary grain and the complete rachilla with its surface of articulation.

The small white grain is narrow and has less husk than the majority of our varieties. The base of the primary grain is solidified, the secondary grain is easily dislodged from the rachilla, with which it articulates, and basal hairs are quite wanting. The grain characters of this variety are illustrated in Fig. 25. There are, however, some strains which have a development of numerous, extremely short inconspicuous basal hairs. The usual

strain of this variety has very few awns, a weak awn being present on the first grain only, with a large percentage of the grains quite awnless. The strain known as Reid, however, has a weak awn, which in some cases approaches the intermediate type, on the first grain only of nearly all the spikelets.

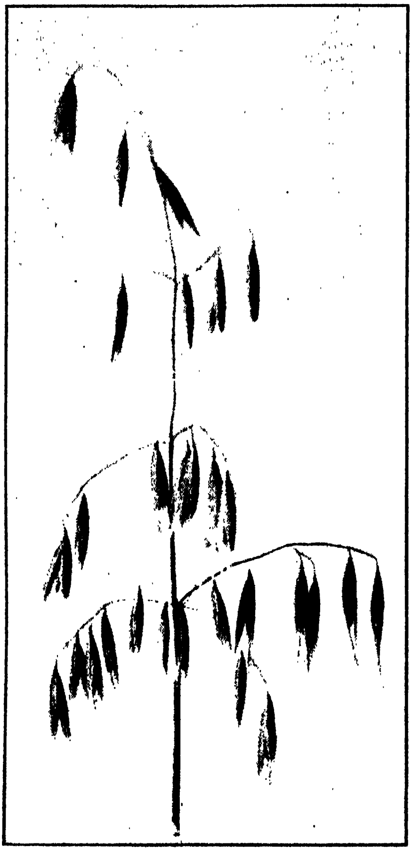


Fig. 26.—Panicle of Palestine.
This variety has a very open, pyramidal panicle, the rachis of which leans over very noticeably.

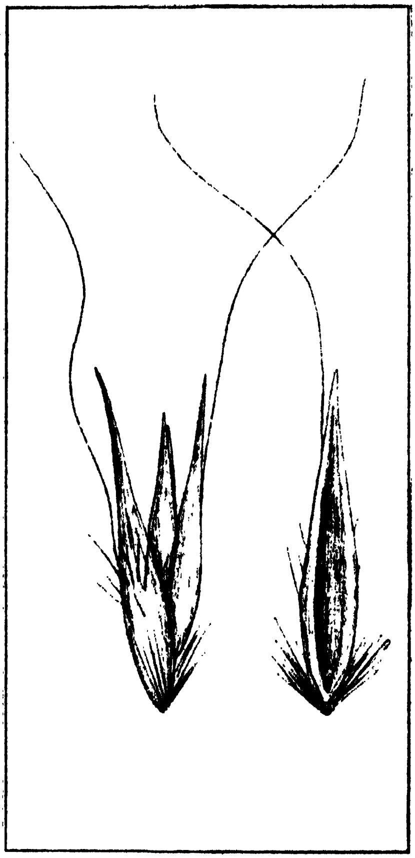


Fig. 27.—Spikelet and Grain of Palestine.
A pronounced basal scar, numerous long basal hairs, a few hairs on the flowering glume, and fracturing rachilla are typical. Note also the weak awns on the primary and secondary grain of the spikelet.

Agronomically the variety is far too late, coarse and flaggy for growth in hot dry districts; under such conditions it never succeeds well and is liable to total failure. It is best suited to the coldest tableland districts of high spring and summer rainfall, where it is particularly adapted to spring sowing, making a heavy and abundant growth of fodder and yielding well for grain when other varieties would show a marked tendency to run to seed with poor development. For this alone its popularity is maintained

in the cool tableland areas where diversified cropping makes spring sowing desirable and profitable. Its rather small grain and very coarse straw leave considerable room for improvement.

On account of its resistance to stem rust, White Tartarian will remain popular in the cooler tableland areas until more desirable rust-resistant types have been bred. It is susceptible to crown rust and particularly liable to loose smut

Palestine.

Palestine is a Syrian variety which was introduced into Victoria by Dr. Cherry. Although in general grain characters this variety is remarkably like Algerian, it is readily distinguished from the latter in early growth. Its semi-erect habit, moderate stooling ability (2½ to 3), medium-broad to broad foliage and very hairy leaf-margins are all features which contrast with their parallels in Algerian. The very short straw of Palestine is medium-coarse, but not very strong. The nodes are glabrous and the straw on maturity may show a tinge of purple.

Palestine has a medium-large, very open, pyramidal panicle, the rachis of which leans over very noticeably towards its apex. The branches are medium-long, leaving the rachis almost at right-angles and drooping over at their tips. The large spikelets are not abundant and are usually concentrated most in the branches from the basal nodes. Three grains are normally present in all spikelets, and the first and second of these invariably bear weak awns. A pronounced basal scar similar to that in Algerian marks the base of the primary grain; associated therewith are numerous long basal hairs arranged in two definite tufts. The grains of the spikelets are firmly united, fracture of the rachillae being necessary to separate them; in spite of this Palestine threshes readily. A few long hairs are present on the flowering-glume (or lemma), which envelops the grain.

This oat is very early maturing, has high-yielding ability, and is admirably suited to hot dry conditions, but its very short straw militates against its popularity. Furthermore, it suffers more than any of our leading varieties from stem rust. It is also highly susceptible to crown rust and loose smut. As a grazing type it is practically useless, completely lacking recovery power. On areas where excessive growth of straw is common, Palestine may prove particularly suitable.

(To be continued.)

WHY IT IS NECESSARY TO FEED ADEQUATELY.

OTHER things being equal, the animal that consumes the greatest amount of feed gives the best return. It is also clear that if an animal gets only sufficient food for bare subsistence, the farmer gets nothing in return for his feeding. It is the amount in excess of the vital demands of the animal that is devoted by it to the formation of the product, the yield of which is the reason for the animal's place on the farm.

A Moth Pest of Wheat and Oats.

Ptochostola microphaella Walker.

E. J. WASON, H.D.A., B.Sc.Agr., Assistant Entomologist.

DURING August, September, and November, 1930, wheat and oats crops in the Binnaway (north-western plains), Murrumburrah (south-western slopes), and Bathurst (central tablelands) districts were attacked by the caterpillars (larvae) of what proved to be a grass moth (*Ptochostola microphaella* Walker; syn. *Crambus dimidiellus* Meyrick), which was first described by Walker in 1866 as *Crambus microphaellus* (List. Spec. Lepid. Inst. British Museum, part 35, supl. 5, page 1758), occurring in the Sydney district. Meyrick states (*Proc. Lin. Soc. N.S.*W., vol. 3, 1878, page190) that this species is very common around Sydney and Parramatta and in the Lower Hunter River district; also that specimens had been received from Rockhampton, Queensland.

In addition to attacking wheat and oats in 1930, the caterpillars were also recorded as attacking herbage in the Murrumburrah district. The species is one that is often abundant in pastures. No reports of further damage were received during 1931.

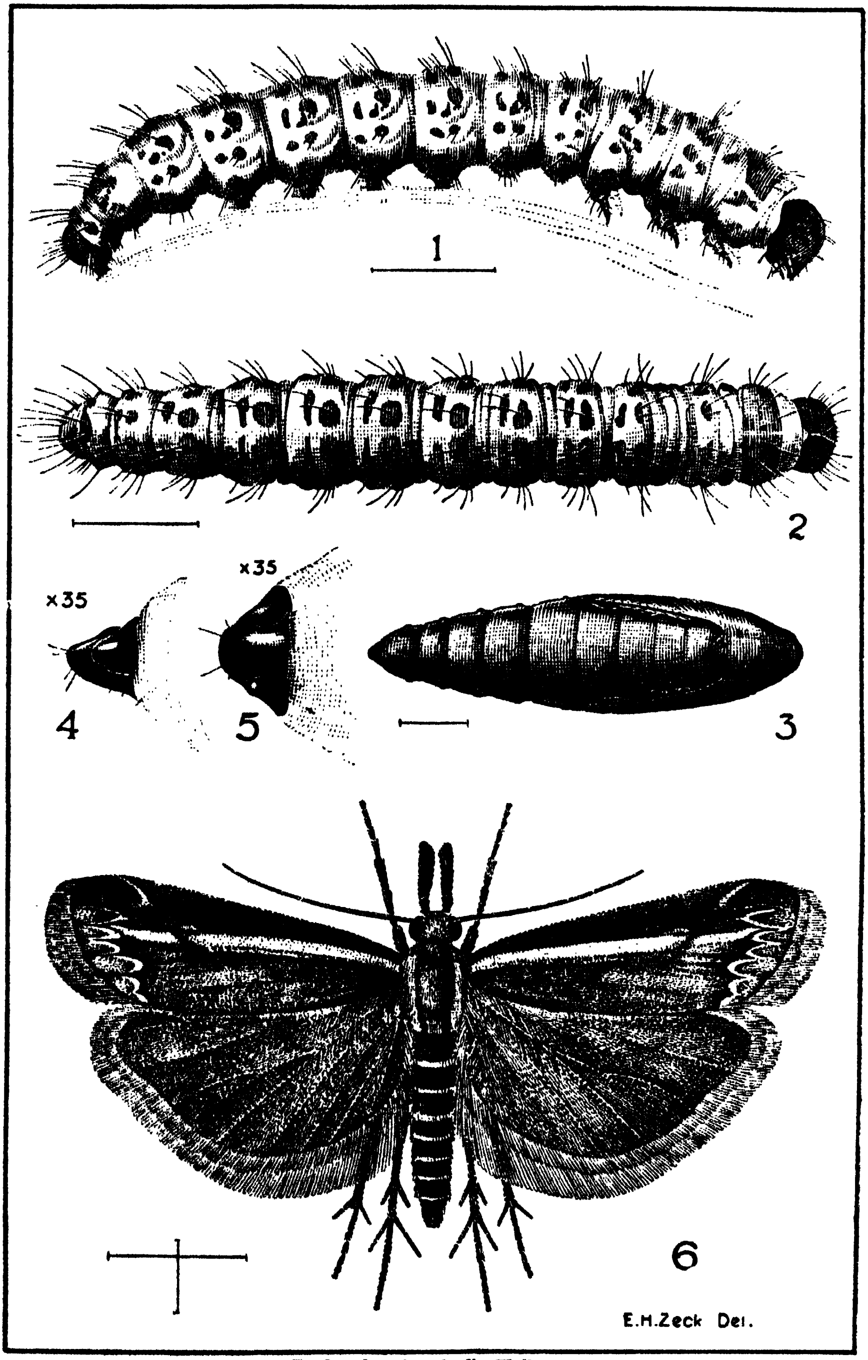
Description of Moth and Caterpillar.

The moth is usually small with narrow elongate fore-wings. It measures slightly more than half an inch across the outstretched wings, which are a brownish-grey colour. The fore-wings are marked with a longitudinal silver stripe. The hind-wings are fringed with fine scales and are a duller colour than the fore-wings. The moth rests by day on the grass stems in an upright position with the wings closely folded.

The caterpillars, which usually feed on grasses, reeds, or moss, are approximately three-quarters to one inch long when fully matured. They are of a uniform light-brown colour, while the head is of a deep brown (almost red) colour. Extending back in the form of an arc from the first margin of the dorsal surface of the first thoracic segment is a delicately chitinised shield of light-brown colour. The larva is typical of the order Lepidoptera in that it has three pairs of true legs and five pairs of so-called "prolegs"; the first four pairs are known as the abdominal feet and the remaining pair as the anal claspers. The caterpillars pupated within silken galleries several inches below ground level.

Infestation and Damage.

On examining the infested areas, which were localised, the caterpillars were found just below ground level, clustered in and around the butts of the attacked plants. They construct silken galleries in which they shelter



Ptochostola microphaella Walker.

1 and 2.—Caterpillar. 3.—Pupa (dorsal view). 4.—Terminal segment of pupa (lateral view). 5.—Terminal segment of pupa (dorsal view). 6.—Adult moth.

by day, coming above ground at night to feed on the growing shoots of the wheat and oats. The shoots were nipped off near the ground level, causing bare patches in the crop. At Binnaway patches varying from 10 to 150 square feet in size were continually eaten down, preventing any growth; approximately 2 acres in a paddock of 250 acres were destroyed by the caterpillars. The damage at Binnaway was therefore circumscribed and limited to less than 1 per cent. of the total crop. It is deemed advisable, however, to place this damage on record and to keep the moth under observation in the future, as there is the possibility of its assuming pest proportions over wide areas.

Control.

Steps were taken to test control measures as soon as the pest was recorded. A poison bait of bran and arsenite of soda proved very effective. The bait was made up as follows:—One and a half pounds of arsenite of soda was dissolved in 3 gallons of water, to which was added 24 lb. of bran. The whole was thoroughly mixed until a uniform crumbly mash was obtained, which was then broadcasted lightly over the infested areas.

POTATO STRAIN TRIALS ON THE UPPER NORTH COAST.

STRAIN trials were carried out on the Clarence and Bellinger Rivers last season, Messrs. H. Bancroft, of Lawrence, and H. W. Kirkland, of Bellingen, co-operating with the Department.

The season was extremely unfavourable to early potatoes, while a severe frost on the Clarence towards the end of August cut the crops at that centre to the ground.

The results were as follow:—

Variety.	Strain.	Yields per acre at—	
		Lawrence.	Bellingen.
		tons. cwt. qr.	tons cwt. qr.
Factor	A. Gorman, Bannister ...	....	6 16 1
Factor	J. J. Maloney, Taralga ...	4 15 1	6 8 0
Factor	A. H. Price, Bannister ...	....	6 7 1
Factor	P. A. Kingham, Millthorpe ...	....	6 3 0
Factor	A. Gay, Kialla	....	6 1 0
Factor	Batlow A (Batlow Packing House Ltd.).	4 3 3	....
Factor	T. A. Oates, Millthorpe ...	4 1 3	....
Up-to-date	Seed from Dorrigo	....	3 16 1
Factor	D. Harries, Bannister ...	3 2 1	3 10 2
Alpine Wonder (Satisfaction type).	G. L. Brien, Oberon	0 17 3	....
Alpine Wonder (Early Rose type).	G. L. Brien, Oberon	0 12 1	....

—M. J. E. SQUIRE, Agricultural Instructor.

Wheat and Oat Trials, 1931.

FARMERS' EXPERIMENT PLOTS.

Western District (Dubbo Centre).

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

DURING the 1931 wheat season farmers co-operated with the Department in carrying out wheat and oat trials at Eurimbla, Wellington, Spicer's Creek, Wongarbon, Nubingerie, Toongi, Dubbo, Eumungerie, Balladoran, Gilgandra, Armatree, Coonamble, Narromine, Mungeribar and Wyanga.

The Season.

The rainfall registrations at the various centres are given in the following table, while for more detailed comment on the season readers are referred to the author's report on the wheat crop growing competitions in the same district (see February issue of this *Gazette*, page 123).

RAINFALL Records, 1930-1931.

	Eurimbla.	Wellington.	Wongarbon.	Spicer's Creek.	Nubingerie.	Toongi.	Dubbo (H. J. Harvey)	Dubbo (G. E. Lee).	Eumungerie.	Balladoran.	Gilgandra.	Armatree.	Mungeribar.	Narromine.	Wyanga.	Coonamble.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts
Rainfall on Fallow.																
1930.																
June	...	...	289	...	...	...	...	...	...	...	...	...	...	...	...	...
July	294	...	340	359	...	...	...	...	...	272	...	...	...	...	164	...
August ...	133	200	174	223	...	...	...	...	164	142	88	...	...	..	120	...
September ...	10	78	30	58	...	...	30	...	40	46	34	59	...	...	13	...
October ...	425	380	386	398	348	374	359	264	296	358	337	254	...	...	222	...
November ...	159	220	208	241	187	167	159	169	394	165	125	106	...	...	148	...
December ...	436	496	392	452	392	364	207	205	109	215	180	192	...	...	275	...
1931.																
January ...	160	159	132	128	142	124	150	130	119	149	140	149	...	128	125	86
February ...	102	63	20	32	...	17	30	12	40	92	40	38	28	38	...	50
March	284	588	501	857	485	471	352	330	255	640	626	582	728	857	535	523
Total on fallow	2,008	2,184	2,472	2,754	1,554	1,517	1,287	1,119	1,417	2,079	1,570	1,380	956	1,023	1,602	659
Rainfall on Growing Crop.																
1931:																
April	456	287	304	330	310	274	327	335	416	409	360	354	333	330	257	64
May	475	606	445	508	503	571	475	474	506	516	483	507	456	508	488	381
June	423	354	413	342	336	430	422	427	409	325	370	410	331	342	386	362
July	150	164	80	295	128	188	203	203	134	152	124	187	313	295	267	102
August... ...	58	52	55	10	24	35	85	22	37	34	16	42	11	10	21	15
September ...	163	100	73	60	80	77	60	51	48	46	99	50	55	60	97	20
October ...	50	86	47	37	52	42	38	32	45	24	20	65	19	37	36	...
Total on crop	1,775	1,649	1,417	1,582	1,433	1,617	1,560	1,544	1,595	1,506	1,472	1,615	1,518	1,582	1,552	944

CULTURAL Details and Yields of

District ...	Eurimbla.	Wellington	Wongarbon.	Spicer's Creek.	Nubingerie.	Toongi.	Dubbo.
Experimenter ...	J. Berney	Quirk and Everett.	N. H. Hubbard.	J. Crossing, "Oakey Camp."	P. J. Baker.	A. J. Harper.	H. J. Harvey, "Kindalin."
Nature of soil ...	Chocolate clay loam, limestone origin.	Gravelly, chocolate clay loam.	Medium-free red loam, basalt.	Light sandy, red to grey loam, slate.	Chocolate self-mulching clay loam, from basalt.	Medium red loam.	Red sandy loam
Ploughing ...	Scarified February, 1930, sown with oats, fed-off, mouldboard ploughed December, 4 ins.	Scarified 3½ ins., mid-August.	Springtoothed late May with narrow points.	Scarified July.	Mouldboard, 4 ins., October.	Mouldboard, 4 ins., October.	Disced, 3 ins., early September.
Cultivation ...	Harrowed February and March, scarified mid-April.	Harrowed late September, scarified early January, harrowed mid-January, scarified early March, harrowed late March, scarified early April.	Disc sundercut late September, 3 ins., disced February, harrowed mid-April.	Scarified late February and mid-April.	Springtoothed early February, scarified mid-March.	Harrowed November, December and late January, springtoothed mid-March.	Scarified October, early January, late March, springtoothed early April and early May.
Sown with ...	Combine ...	Drill	Combine ...	Drill and combine.	Rigid tine combine.	Combine ...	Combine
Date of sowing ..	17 18 April	13–15 April.	23–24 April.	15–21 April.	22–23 April	21–22 April.	7–9 May.
Seed per acre ...	60 lb.	60 lb.	50–55 lb.	45 lb.	55–60 lb.	50 lb.	53–60 lb.
Superphosphate per acre ...	70 lb.	56 lb.	60 lb.	56 lb.	60 lb.	56 lb.	60 lb.
After-treatment..	Harrowed after sowing.	Harrowed and cross-harrowed	Cross-harrowed	......	......	......	Cross-harrowed
Remarks ...	Heavy rain storm badly washed out plots.	......	Soil fertility impoverished by growth of stink grass	Sowings delayed by rains.	Frosts caused damage to Waratah, Bobin, Clarendon, Geeralying.	New ground. Frost damaged Nabawa.	......
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Ansvie	......	......	......	......	......	......	......
Bald Early ...	......	......	......	......	31 38	......	......
Baringa ...	......	......	......	......	......	......	......
Baroota Wonder	......	......	......	......	......	......	27 12
Barwang ...	......	......	......	16 42	......	......	25 24
Bobin	......	29 32	......	31 47	24 1	......	43 50
Bredbo	......	28 16	......	......	......	......	......
Cadia	......	......	......	20 21	......	......	......
Canimbla ...	......	......	17 7	......	......	30 15	......
Cariada ...	25 28	......	16 24	......	......	......	......
Clarendon ...	......	......	......	......	16 40	......	......
Currawa ...	28 43	28 23	......	......	......	26 37	......
Duchess ...	......	......	19 8	......	......	......	......
Dundee ...	33 43	32 28	19 22	......	......	......	......
Duri	......	......	......	......	......	......	......
Early Bird ...	......	......	......	......	......	......	......
Exquisite ...	......	......	......	19 29	......	32 20	......
Federation ...	......	......	......	......	......	22 36	......
Ford	26 23	37 41	23 43	......	38 37	30 40	39 21
Free Gallipoli ...	24 18	......	......	......	......	......	......
Geeralying ...	......	......	......	......	22 5	......	40 24
Gresley	......	......	......	......	......	......	......
Gullen	......	......	......	......	......	......	37 32
Hard Federation	......	......	......	......	......	......	......
Marshall's No. 3	......	......	......	......	......	......	......
Nabawa ...	22 5	29 32	18 17	22 55	35 16	22 57	32 47
Rajah	......	......	......	......	......	......	......
Ranee	......	......	......	......	......	......	......
Riverina ...	......	......	......	......	......	......	......
Sepoy	......	35 6	......	......	......	......	......
Wandilla ...	......	......	......	26 7	35 50	......	......
Waratah ...	......	......	......	......	29 25	......	......

Wheat Variety Trials, 1931.

Dubbo. G. R. Lee, "Oakwood."	Eumungerie. G Longmire.	Balladoran. J. Parslow	Gilgandra. W G Law.	Armatree J Hodgson	Narromine. Evan Jones.	Mungeribar. J. Maynard, "Willedah."	Wyanga. S. C. Taylor.	Coonamble H. A. White.
Medium red sandy loam.	Medium sandy loam.	Grey sandy to clay loam, semi-mulching.	Grey to chocolate clay, self-mulching loam.	Medium red loam.	Medium red clay loam.	Red clay loam	Medium red loam.	Red sandy loam.
Sundercut, 3 ins., early October.	Mouldboard, 3 ins., August.	Disced mid-July.	Scarified mid-August.	Disced, 4 ins., late August.	......	Disced early February.	Mouldboard June, 4 ins.	Disc-sundercut April.
Spring-toothed mid-December, late January, mid-April.	Disced early April, harrowed early May	Springtoothed early September, early October, early and late January, early and mid-March, and early and late April.	Scarified early September, harrowed mid-September and scarified late October, early January, late March and mid-April.	Springtoothed early and late February, early and late March and mid and late April.	Stubble burned February, springtoothed mid-March, mid-April.	Scarified late February and late March. springtoothed mid-May.	Harrowed September, springtoothed early January and late April.	......
Combine ...	Combine ...	Disc drill ...	Hoe drill ...	Hoe drill ...	Combine ...	Combine ...	Combine ...	Combine.
9–11 May	4–5 May.	27–28 April.	28–30 April.	30 April–1 May.	11-12 May.	4–5 June.	21–22 May	5–6 May.
50–55 lb.	50 lb.	52 lb.	43–55 lb.	45–50 lb.	55 lb.	60 lb.	58 lb.	50 lb.
56 lb	50 lb.	50 lb.	56 lb.	56 lb.	50 lb.	56 lb.	50 lb.	Nil.
Cross-harrowed	......	......	......	......	......	......	......	......
Sown in wet seed-bed after 36 pts. rain.	Uneven seed-bed, with grass roots and suckers.	Some hard patches due to water washes	Severe hail damage to all plots, except Sepoy.	......	......	Partly bogged in; sowing delayed three weeks by heavy rains.	Waterlogged, sown in wet seed-bed after heavy rains.	......
bus. lb.	bus lb.	bus. lb	bus lb.	bus lb.	bus. lb	bus. lb.	bus. lb.	bus. lb.
32 52	......	29 15	......	......	......	......	......	19 36
......	......	......	......	......	......	22 38	......	22 29
......	......	......	......	31 20	......	......	......	......
......	......	......	10 7	......	......	......	19 12	......
25 23	......	19 6	......	......	......	......	......	......
36 26	8 18	32 29	20 31	30 40	31 31	23 56	......	22 33
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	20 32	......	19 36
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......
......	......	......	22 20	......	......	......	......	......
......	......	......	......	......	......	23 10	......	17 27
......	......	......	......	......	......	......	......	20 35
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	11 54	......
......	......	......	......	......	......	......	......	......
......	12 36	......	......	......	......	......	......	......
......	......	31 33	22 29	26 13	23 33	24 11	16 7	20 23
......	......	......	......	......	25 41	......	......	24 1
......	......	......	......	......	......	......	......	20 0
......	......	......	......	......	......	......	14 21	......
26 48	10 5	24 34	49 0	26 2	26 31	18 19	18 0	17 39
......	......	......	......	31 29	......	......	18 18	......
......	15 46	......	......	......	25 44	......	......	......
26 50	16 29	30 53	......	......	......	......	......	17 30
......	......	......	40 15	......	......	......	......	......
......	......	......	......	......	......	......	......	......
......	6 51	......	......	23 0	......	......	......	17 3

The Outstanding Varieties.

The outstanding varieties of these trials were Bobin, Geeralying, Ford, Dundee, Sepoy and Baringa.

Bobin (Thew x Steinwedel) has proved itself to be a high-yielding variety, provided it is not attacked by rust. It topped the yields at five different centres, and is an excellent bag-filler, showing fair strength of straw and good quality grain; it is not liable to shell and is fairly resistant to flag smut.

Geeralying (Huguenot x Bunyip), a Western Australian early-maturing variety, has again demonstrated its undoubted high-yielding qualities, besides being an extremely palatable sweet-strawed variety useful for hay. It is immune to flag smut, shows fair strength of straw, and is likely to become popular.

Ford (Fan x Comeback x Tardent's Blue x Zealand) is a South Australian tall-strawed, white-eared variety, highly resistant to rust and flag smut. It is mid-season to late in maturity and shows exceptional strength of straw. This year it gave high yields wherever tested, and is likely to become very popular as an early sowing variety when seed is available for distribution.

Dundee (Hard Federation x Cleveland x Sands) also yielded well where tried and is of distinct promise.

Sepoy (Currawa x Indian H. x Federation) is a Victorian crossbred with stiff, short straw, brown clubbed ears; it is late maturing. It yielded exceptionally well at the only two centres where tested.

Baringa (Gullen x Bomen), an early-maturing variety, was only tried at one centre where it gave the best return, and it appears to be a promising variety with good quality grain.

Nabawa (Gluyas Early x Bunyip), which was used as a standard at all centres this year, while yielding well at some centres, did not come up to its performances during the previous three years, and it would appear that it is not partial to very wet conditions in the winter during its early stages of growth. It did not stool as well as some other varieties and seems very susceptible to frost damage. Still it was extensively sown this year and returned good average yields in all districts, and must remain a popular wheat on account of its rust and flag smut resistance. It is likely to do better in a drier season.

Aussie again gave consistent yields, and in spite of its liability to flag smut seems to be a suitable variety for this district.

Other varieties to do well were Bredbo, Gullen, Bald Early, Canimbla, Wandilla and Rajah. Varieties which gave disappointing performances this season were Barwang, Baroota Wonder, Duchess, and Waratah.

Fertiliser Trials with Wheat.

As in former years, a manurial trial with the standard wheat, which this year was Nabawa, was incorporated in all wheat variety trials. All plots with the exception of that unmanured were fertilised with amounts of superphosphate, varying from 50 to 70 lb. per acre, the heavier quantities being used in localities which have demonstrated that it is profitable to use greater dressings than the normal one of about 56 lb.

RESULTS of Fertiliser Trials with Nabawa Wheat.

Superphosphate per Acre.	Eurimbla.	Wellington.	Wongarbon.	Nubingerie.	Toongi.	Dubbo (H. J. Harvey)	Dubbo (G. R. Lee).	Eumungerie.	Balladoran.	Gilgandra.	Armatree.	Mungeribar.	Narromine.	Wyanga.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
50 lb. ...	...	...	...	...	...	...	...	10 5	24 34	...	...	...	26 1	18 0
56 lb. ...	...	29 32	...	...	21 46	...	26 48	...	...	19 0	26 2	18 19	...	...
60 lb. ...	...	...	18 17	35 16	...	32 47	...	...	...	...	...	...	...	...
70 lb. ...	22 5	...	...	...	...	...	...	...	...	...	...	...	...	...
Unmanured	18 52	28 23	16 40	31 48	22 57	30 16	25 48	8 42	22 6	20 5	25 2	16 37	26 31	14 50
Increase ...	3 13	1 9	1 37	3 28	...	2 31	1 0	1 23	2 28	...	1 0	1 42	...	3 10
Decrease ...	...	...	...	...	1 11	...	...	...	...	1 5	...	...	0 30	...

NOTE.—Frost damage was more severe in the manured plot at Toongi, and this would probably account for the negative result. At Gilgandra, where the plots were severely damaged by hail during September, the manured plot was more forward, thereby sustaining more damage.

As the use of artificial fertilisers is still largely thought not to be necessary in this portion of the State, and particularly as the economic conditions of the past year gave the extension of its use a further setback, the object of these manurial trials at present is rather to demonstrate, and determine its value as an aid to increased yields when used in reasonable quantities, than to assume that it will produce results similar to the southern wheat areas of this State and carry out extensive and elaborate manurial trials in order to find out the exact amount best suited to varying types of soils and localities.

The results show increased yields of from 1 to 3½ bushels per acre at all centres except three, where other influences, explained in the footnote to the table, probably caused negative results.

Wheat Rate-of-seeding Trials.

Results obtained this year favoured a medium seeding of from 55 to 60 lb. per acre, though at Balladoran a heavier seeding of 70 lb. gave an increase of 1 bus. 20 lb. over the medium sowing of 50 lb. The season was generally favourable to good germination and stooling from early seeding, provided undue waterlogging did not occur.

YIELDS in Rate-of-seeding Trials with Wheat.

Seed Per Acre.	Dubbo. (H. J. Harvey.)	Eurimbla.	Balladoran
	bus. lb.	bus. lb.	bus. lb.
35 lb.	....	....	22 50
40 lb.	....	28 38	....
45 lb.	31 23	....	....
50 lb.	....	....	25 0
55 lb.	33 41	....	....
60 lb.	....	30 36	....
65 lb.	32 51	....	....
70 lb.	....	....	26 20
80 lb.	....	23 12	....

NOTE.—Geeralying was the variety used at Dubbo, and Nabawa at the other two centres.

Oat Variety Trials.

Oats for grain were under trial at fourteen centres, Algerian being used as a standard variety for comparison throughout. This oat is perhaps still the best grain or hay variety, provided conditions are suitable for its growth. It has fine straw and excellent stooling proclivities, but frequently, in the event of a dry spring, it receives a severe check owing to its slow maturing habits, and it then tends to hay off or fails to fill the grain properly. In addition, Algerian does not provide the bulk of early green feed frequently demanded by growers of oats with a dual-purpose objective, consequently it is being largely superseded by other faster-maturing varieties, which are more palatable in their earlier stages of growth and more likely to mature a hay or grain crop after being fed off.

CULTURAL Details and Yields of Oat Variety Trials, 1931.

District	Burimbla.	Wellington.	Wongarbon.	Spicer's Creek.	Nubingerie.	Toongi.	Dubbo.	Dubbo.	Eumungerie.	Balladoran.	Gilgandra.	Armatree.	Narromine.	Mungeribar.
Experimenter	J. Berney.	Quirk and Everett.	N. H. Hubbard.	J. Crossing.	P. J. Baker.	A. J. Harper.	H. J. Harvey.	G. R. Lee.	G. Longmire.	J. Parslow.	W. G. Law.	J. Hodgson.	Evan Jones.	J. Maynard.
Date of sowing	...	...	...	...	...	...	...	...	...	...	...	1 May.	12 May.	5 June.
Seed per acre	55 lb.	50 lb.	50 lb.	50 lb.	50 lb.	50 lb.	50 lb.	50 lb.	50 lb	50 lb.	50 lb.	50 lb.	50 lb.	50 lb.
Superphosphate per acre ...	70 lb.	56 lb.	60 lb.	56 lb.	60 lb.	56 lb.	40 lb.	50 lb.	50 lb.	50 lb.	50 lb.	56 lb.	50 lb.	56 lb.
After treatment	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Remarks	Heavy storm caused washes through plots	...	...	...	...	...	...	Guyra oats knocked down by wind and rain; only about quarter yield obtained	All varieties tipped by dry weather	Algerian affected by dry spring.	...	...	...	...
Varieties.	bus lb	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus lb.	bus. lb.	bus. lb.	bus lb.	bus lb
Algerian	28 27	38 31	31 24	42 17	61 17	47 39	57 1	......	24 28	33 5	55 34	45 8	32 33	28 9
Belar	23 18	......	17 23	44 47	55 30	29 33	......	......	21 28	......	......	......	24 29	25 8
Buddah	......	36 39	......	......	......	32 2	......	......	......	42 28	......	......	28 31	25 5
Gidgee	......	......	21 17	......	63 9	......	......	63 23	......	......	56 33	......	28 32	......
Guyra	......	48 27	24 31	50 31	......	......	46 9	12 30	......	54 14	48 38	43 17	......	......
Lachlan	......	......	......	......	......	......	33 18	......	......	......	43 35	......	......	......
Mulga	......	......	......	12 21	32 21	......	......	......	27 22	......	......	......	......	......
Palestine	47 36	35 9	......	......	......	......	73 22	43 12	......	47 36	......	49 22	......	......

NOTE.—The cultural details in these oat trials, also dates of sowing, except where shown otherwise, were the same as for the wheat trials (see table on pages 264 and 265).

Reference to the table shows that some exceptionally high yields were obtained, and it is probable that the yield of 73 bus. 22 lb. obtained by Mr. H. J. Harvey, of Dubbo, is a record for this district.

Palestine, a short-strawed, very early maturing variety, again yielded well this year and is likely to be a useful grain oat.

Gidgee did exceptionally well, and is a fine type of early-maturing dual-purpose oat.

Guyra and *Belar,* two mid-season varieties, continue to demonstrate their suitability as dual purpose oats, and are adaptable to varying seasonal conditions, with the added advantage of being less liable to lodge or shell their grain than the faster-growing varieties, such as Mulga, Buddah and Sunrise.

Diseases in Crops.

Stem rust, the disease which did so much damage to wheat crops in this district during 1930, although in evidence this past season, did not do any material damage.

Certain varieties of oats were more susceptible than usual last season to one or other of the biological forms of rust.

Flag smut was present in crops as usual, but seasonal conditions were not favourable to its development, and losses from it were only light. Besides, many of the varieties now being grown are more or less resistant to this disease.

Take-all and *foot-rot* were more prevalent than usual, probably on account of the wet winter. Take-all was seen this year in localities where it had not been previously noticed.

Septoria leaf-spot was more noticeable than usual, no doubt also due to the wet winter.

Frost damage was severe this year. A few crops were caught in their earlier stages of growth, some when coming into ear, many at the flowering stage, but most by severe late frosts after the grain had set. Apparently the sap supply was prematurely cut off, as the grain failed to fill, and the ears became slab-sided and died off a greyish-green colour. All crops seen were more or less affected, and in some crops the loss of yield was severe.

Mudgee–Coonabarabran District.

G. NICHOLSON, H.D.A., Senior Agricultural Instructor.

Farmers co-operated with the Department in carrying out wheat and oat experiments at Kenebri, Baradine, Teridgerie, Bugaldi, Ulamambri, Purlewaugh, Coolah, Mooren, Mendooran, Tallawang (via Gulgong), Birriwa and Havilah (via Mudgee).

The Season not Wholly Favourable.

The amount and incidence of the rainfall were not wholly favourable to crop production, particularly on the lighter and poorly-drained soils. Good drainage was the main factor influencing yields, and in this respect soils of basaltic origin with good retentive subsoils showed to distinct advantage. The greater number of the experiment areas were located on the lighter soils, and many of these were water-logged during the winter months. This had the effect of retarding root development and stooling, and when the heavy rains ceased in mid-July the surface soil rapidly dried out and set like mortar. In these instances the crops failed to make normal progress during the dry spring months and the growth was spindly and lacking in vigour.

The rainfall figures for the principal centres are given in the following table, while for further comment on the season readers are referred to the author's report on the wheat crop-growing competitions in this district (see *Agricultural Gazette* for February, page 131).

RAINFALL Table—Mudgee-Coonabarabran District.

	Kenebri (Mrs. M. Worrell).	Baradine (R. Johns).	Baradine (G. Hotchkiss).	Teridgerie (T. Butler).	Bugaldi (E. Ferguson).	Ulamambri (R. Young).	Purlewaugh (A. B. Langdon).	Mooren (S. McClelland).	Mendooran (F. G. Jones).	Tallawang (Robinson Bros.).	Havilah (P. White).
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
Summer Fallow Period (January to March).											
January	93	127	104	84	144	170	50	347	100	235	187
February	61	26	9	196	27	23	70	46	59	92	45
March	442	503	704	385	482	508	800	282	578	1000	603
Total, Fallow Period	596	656	817	665	653	701	920	675	737	1,327	835
Growing Period (April to November).											
April	249	293	306	237	262	283	750	126	320	370	162
May	430	546	428	183	423	403	710	486	389	553	454
June	462	541	460	437	598	316	675	527	299	493	414
July	78	59	51	130	62	84	30	212	125	175	131
August	27	36	59	30	73	25	150	21	65	109	91
September	28	25	16	14	57	62	35	68	67	99	105
October	25	14	Nil.	Nil.	13	18	5	46	28	90	152
November	...	...	...	...	...	228	...	...	...	130	270
Total, Growing Period	1,299	1,514	1,320	1,031	1,488	1,369	2,355	1,486	1,293	2,019	1,770

Wheat Varieties.

Wheat-growers generally are ready to accept almost any new variety that has received publicity, very often without sufficient trial, and discard the older types that are known to be suitable to the district. Occasionally the practice proves successful, Nabawa being a case in point. This variety yielded very consistently in 1930, and although it did not do quite so well this season, the yields were satisfactory. Nabawa is a variety which gives

Cultural Details and Yields

District	Kenebri.	Baradine.	Teridgerie.	Baradine.	Baradine.	Bugaldi.
Experimenter	Mrs. M. Worrell.	G. Hotchkiss, "Anawa"	T. A. Butler, "Ryheen."	R. Johns, "Ule-Wallen."	J. A. Hatton, "Cumberdeen."	E. Ferguson.
Nature of soil	Medium-heavy brown loam.	Sandy brown loam.	Light to medium loam	Light, poor, sandy loam.	Light brown loam.	Light, silty loam.
Ploughing	Disced, 3 ins., March.	Scarified, 3 ins., early March.	Disced, 4 ins., January.	Disced, 4½ ins., July.	Disced, 3 ins., March.	Mouldboard, 4½ ins., July.
Cultivation	Disc harrowed early April, sown with combine in moist seed bed.	Scarified 15 April, sown with combine in moist seed bed.	Springtoothed February, sown with combine in moist seed bed	Springtoothed January and April, sown with disc drill in moist seed bed.	Sown with combine in moist seed bed.	Springtoothed October, skim-ploughed February, harvested February, disced and harrowed April, sown with disc drill in moist seed bed.
Date of sowing	10 April	8 May.	16 April.	11 April.	2 May	9 April.
Seed per acre	45 lb.	50 lb.	45 lb.	50 lb	55 lb	46 lb
Superphosphate per acre	Nil.	42 lb.	Nil.	56 lb.	Nil	Nil
After treatment	Fed-off too late in July.	Not fed-off ...	......	Fed-off... ...	Fed-off lightly	Fed-off ...
Remarks	Early-maturing varieties suffered.	Poor drainage; growth affected by wet winter.	Frost damaged. Waratah and Riverina affected most	Poor drainage affected stooling.	Some frost damage; also wind near harvest.	Some varieties affected by poor drainage.
Varieties.	bus. lb	bus. lb.	bus. lb	bus lb.	bus. lb.	bus lb.
Aussie	23 30	......	......	......	21 54	......
Baroota Wonder	......	15 12	......	......	15 47	......
Bena	......	......	......	......	......	13 32
Baringa	......	......	......	......	......	10 18
Barwang	......	......	......	......	......	......
Bobin	21 9	20 24	......	......	......	......
Bredbo	......	......	......	......	......	......
Burrill	......	17 25	......	......	......	......
Cadia	......	......	......	......	......	......
Canberra	14 3	......	......	......	......	......
Canimbla	......	......	......	......	......	11 40
Carinda	......	......	......	13 7	......	......
Clarendon	16 23	......	18 0	......	......	......
Cleveland	......	......	......	......	......	......
Currawa	......	......	......	8 58	......	......
Dundee	......	......	......	......	......	19 34
Duri	19 17	......	......	......	22 31	......
Federation...	22 50	......	......	......	21 35	......
Florence	15 50	......	......	......	......	......
Ford	......	......	......	14 40	21 56	......
Free Gallipoli	......	......	23 24	19 56	20 24	......
Geeralying	......	16 36	......	......	......	......
Marshall's No. 3	......	......	......	12 38	......	11 46
Nabawa	21 16	21 6	23 13	13 24	19 33	......
Nizam	......	......	20 10	......	......	......
Penny	......	......	......	14 2	......	19 53
Rajah	......	......	25 4	......	25 48	......
Riverina	......	......	17 0	......	......	......
Ranee	18 17	12 37	19 42	......	......	......
Sepoy	......	......	......	......	......	......
Turvey	......	......	......	......	......	......
Waratah	......	16 35	11 22	......	19 36	......
Wandilla	......	......	......	13 59	......	......
Yandilla King	......	......	......	......	......	......

NOTE.—Trials conducted by Messrs. R. G. Norris and T. Williams, "Morven," *via* Coolah, were partly destroyed by heavy were not brought to finality because of change of ownership of the property.

of Wheat Variety Trials.

Purlewaugh. E. McDowell and A. Burness.	Ulamambri. R. Young, "Darouble."	Ulamambri. H. Duncan, "Hillcrest."	Purlewaugh. A. B Langdon, "Mt. Warwick."	Mooren. S. McClelland.	Tallawang. Robinson Bros.	Havilah. P. White.
Medium heavy basaltic loam.	Medium brown loam	Rich chocolate basaltic loam.	Rich chocolate basaltic loam	Medium red loam	Light grey loam..	Medium brown loam.
Mouldboard 4 ins. August.	Disced 3 ins. March.	Disced 3½ ins. February.	Disced 3 ins. February.	Mouldboard 4½ ins. September.	Disced 4 ins early September.	Disced 4 ins. September.
Scarified October, springtoothed and harrowed March, springtoothed and harrowed April, sown with combine in a moist seed bed	Springtoothed April, sown with combine in moist seed bed.	Springtoothed March, sown with combine in moist seed bed.	Springtoothed April, and again late in April, sown with combine in moist seed bed.	Springtoothed November, disced January, springtoothed April, sown with hoe drill in moist seed bed.	Springtoothed October, January and twice in March, disced May, sown with disc drill in moist seed bed	Disced November, springtoothed February, disced March, sown with combine in moist seed bed.
15 April	6 May.	14 April.	5 May.	15 April.	20 May.	22 April.
45 lb.	50 lb.	55 lb	60 lb.	55 lb.	66 lb	56 lb.
56 lb	56 lb.	56 lb.	Nil.	42 lb.	70 lb.	56 lb.
Not fed-off ...	Fed-off	Fed-off heavily; commenced too late.	Not fed-off ...	Fed-off	Not fed-off ...	Not fed-off.
Forward growth affected by frost particularly Yandilla King.	......	Varieties suffered permanent check	Some frost, hail and foot rot damage; Canberra suffered most.	Baringa and Barwang frosted	Flooded and waterlogged during winter.	Baringa and Barwang frosted
bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb.	bus lb.	bus. lb
......	19 12	......	......	......	......	......
......	......	......	......	......	......	......
......	......	......	......	......	......	......
......	......	......	......	20 38	23 21	26 3
......	18 6	......	......	23 10	20 0	18 19
......	......	......	......	......	......	......
......	......	......	......	......	22 3	......
......	......	......	......	......	......	......
......	......	9 55	......	......	......	17 27
......	......	......	23 49	......	......	......
......	......	12 15	......	......	23 51	......
......	......	......	......	24 29	......	......
......	......	......	......	......	......	......
......	......	13 10	......	29 18	......	17 6
......	......	10 55	......	......	......	......
......	21 6	......	......	......	......	......
......	20 43	......	......	......	......	......
......	......	......	......	......	......	......
......	......	......	......	......	......	......
......	18 14	......	......	26 40	20 52	......
......	......	......	......	......	......	28 0
......	......	......	......	......	......	......
......	......	12 9	......	28 59	......	21 7
......	20 44	......	27 36	......	......	22 13
......	......	......	......	......	......	......
......	......	......	......	......	......	......
......	......	......	......	......	......	......
......	......	......	......	......	......	......
......	......	......	......	......	......	......
34 22	......	......	......	......	......	......
......	......	......	......	29 41	......	......
......	......	......	29 15	......	......	......
......	......	11 13	......	24 39	......	......
24 29	......	11 39	......	28 31	20 24	23 7

thistle growth as a result of heavy rains just prior to harvesting; while the experiments with Mr. W. J Tranter, Birriwa,

best results on well-drained soils or in the drier seasons, being susceptible to foot-rot. It also appears to be more subject to frost damage than many other varieties.

At present chief interest centres around Ford, which has received considerable publicity of late. It yielded moderately well, but at no centre was it outstanding.

Aussie continues to give good results and is worthy of greater attention for late sowing on the lighter soils.

Waratah was not so promising as usual, but low yields at three centres can be attributed to frost damage. The season tended to favour the early heading habit of Waratah, and at one trial it came into ear quite as early as Clarendon.

At Baradine, Baroota Wonder, tried for the first time, made a promising showing of straw, but this proved to be very weak and the grain yield was disappointing.

All plots of Baringa were heavily infected with loose smut. It tipped badly at Bugaldi, was frosted at Mooren and Havilah, but yielded well at the latter centre and at Tallawang.

Dundee, also tried for the first time at Coonabarabran, made a favourable impression.

Sepoy, yet another new variety to the district, gave an excellent yield compared with Yandilla King, but, being later, did not suffer to the same extent from frost damage. Free Gallipoli, Rajah, Duri and Bobin proved to be consistent yielders. In the previous season (1930) these varieties, with the exception of Duri, were heavily rust infected.

Wheat Manurial Trials.

These trials were conducted mainly on the light loams. With one exception increases in yield were obtained from the application of 42 lb. and 56 lb. superphosphate per acre as compared with no manure. The increases were sufficient to cover cost of fertiliser, but showing too small a margin of profit to justify recommending superphosphate for general use.

During the early stages of growth there was a marked difference in favour of the manured plots, and at one stage when the dry spell set in it appeared as though the non-manured plots would be a partial failure. The mild weather, however, favoured the slower development of the unmanured areas. As the preparation of the seed-bed was not of the best in some instances, and, moreover, as a number of these trials were located on country that had carried only a few crops, the increases are of greater interest than would appear at first sight. The satisfactory increase of 5¼ bushels was obtained at Tallawang on old cultivation land that had been fallowed. An increase of over 6 bushels at Purlewaugh (also on fallow) from 1 cwt. superphosphate from a crop grown on rich volanic loam is surprising.

Cultural Details and Yields of Wheat Manurial Trials, 1931.

District	Kenebri.	Baradine.	Bugaldi.	Baradine.	Ulamambri.	Ulamambri	Purlewaugh.	Purlewaugh.	Purlewaugh.	Moores.	Tallawang.	Havilah.
Experimenter	Mrs. M. Worrell, "Errembri."	G. Hotchkiss, "Anawa."	R. Ferguson.	L. A. Hatton, "Cumberdeen."	R. Young, "Darouble."	H. Duncan, "Hillcrest."	A. B. Langdon Mt. Warwick.	M. B. Redden, "Merrybah."	B. J. McDowell & A. Burness, "Yandilla."	S. McClelland.	Robinson Bros.	P. White.
Nature of soil	Medium-heavy brown loam.	Sandy brown loam.	Light silty loam.	Light brown loam.	Medium brown loam.	Chocolate basaltic loam	Chocolate basaltic loam.	Light brown loam.	Chocolate basaltic loam.	Medium red loam.	Light loam ...	Medium loam
Date of sowing	10 April.	5 May.	9 April.	30 April	6 May	14 April.	5 May.	16 April.	15 April.	17 April	19 May.	22 April.
Seed per acre	45 lb.	50 lb.	45 lb.	50 lb.	50 lb.	45 lb.	60 lb.	35 lb.	45 lb.	45 lb.	66 lb.	56 lb
Variety	Federation ...	Nabawa ...	Marshall's No. 3	Waratah ...	Nabawa ...	Yandilla King	Waratah ...	Marshall's No. 3	Yandilla King	Yandilla King	Yandilla King	Yandilla King
After treatment	Fed-off ...	Not fed-off ...	Fed-off ...	......	Fed-off ...	Fed-off too late.	Not fed-off ...	Fed-off ...	Not fed-off ...	Fed-off ...	...	......
Remarks	Yield affected by feeding-off when crop was too far advanced.	......	Waterlogged June and July.	Slight frost damage—most pronounced in manured plot.		Primary growth killed.	Hail damage and foot rot prevalent.		Frosted ...	......	......	......
Fertiliser Treatment—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.
No manure	22 50	13 6	11 46	19 36	13 53	11 39	29 15	21 3	23 9	26 31	15 9	21 3
42 lb. superphosphate	......	21 6	14 53	20 11	20 44	......	......	......	......	28 31	......	......
56 " ...	24 6	......	......	......	......	11 48	30 31	19 43	24 29	......	......	23 7
70 " ...	......	......	......	......	......	......	......	......	......	......	20 24	......
112 " ...	......	......	......	......	......	......	30 55	......	......	......	......	......
140 " ...	......	......	......	......	......	......	......	23 7	29 19	......	......	22 43
Increase from—												
42 lb. superphosphate	......	2 58	3 7	0 35	1 57	......	......	......	......	2 0	......	......
56 " ...	1 16	...	......	......	......	......	1 16	1 26*	1 20	......	5 15	2 4

*Decrease.

Note.—Except at "Merrybah," Purlewaugh, the cultural details are the same as for the wheat variety trials. At "Merrybah" the land was disced 4 inches in July, springtoothed in November, February, and March; sown with combine

To ascertain the value of sulphate of ammonia when used in combination with superphosphate for wheat grown on stubble land, a trial was conducted by Mr. F. G. Jones at Mendooran. The experiment was sown with Nabawa on 18th May on a light sandy loam, but water-logging of the soil in the winter rendered the results of little value.

As compared with a yield of 9 bus. 3 lb. from the unmanured plot and 8 bus. 33 lb. when 70 lb. superphosphate was applied, 87 lb. P 11 fertiliser mixture (6 parts superphosphate and 1 part sulphate of ammonia) gave a yield of 9 bus. 1 lb.; 93 lb. P. 15 mixture (3 parts superphosphate and 1 part sulphate of ammonia) 10 bus. 30 lb.; and 126 lb. M 17 mixture (2 parts superphosphate and 1 part sulphate of ammonia) 11 bus. 3 lb.

Wheat Rate-of-seeding Experiments.

Two rate-of-seeding tests were conducted in the Coonabarabran district, one on a rich chocolate volcanic loam and the other on a light-brown loam. Yandilla King was sown on the former and suffered from frost damage, while the latter was sown a day later with Marshall's No. 3, but was fed off and escaped damage. In both instances the heavier seeding gave the best yield.

Seed Per Acre.	M. B. Redden, "Merrybah," Purlewaugh. (Marshall's No. 3.)	A. Burness and E. McDowell, "Yandilla," Purlewaugh. (Yandilla King.)
	bus. lb.	bus. lb.
30 lb.	19 43	....
45 lb.	29 36	24 29
65 lb.	....	28 35

Diseases in 1931.

The heavy autumn and winter rains favoured rapid development of foot-rot, by far the most prevalent disease of the season. No variety came under notice that could be regarded as immune, Nabawa, Yandilla King, Marshall's No. 3, Canberra and Waratah all being susceptible.

For the past two seasons flag smut has not caused any serious reduction of yield, and this year, with one exception, the experiment areas were particularly free. Leaf-spot was prevalent on most varieties that had made forward and flaggy growth. At this stage there was also every indication of rust developing, therefore in one respect the dry weather that followed was an advantage. Moreover, for a time aphids made an appearance in large numbers, but the low rainfall probably was responsible for a reduction of their activities by September.

Baringa and, to a lesser degree, Baroota Wonder were fairly heavily infected with loose smut.

Oat Variety Trials.

Among the larger landholders wheat-growing is not infrequently regarded as a side line whereby the stock can be kept in condition during the

winter by feeding off, or, in lean seasons, by providing grazing throughout the growing period. Considerable yield reduction has resulted this season from careless feeding off, whereas oats would have produced a bigger bulk of fodder and provided more feeding off than wheat. As yet little attention has been paid to oats in this district for grazing and fodder reserve purposes.

The trial plots that were sown early produced a splendid growth for feeding off during the winter months, but because of the dry spring, when grazing had been unduly delayed, the yield of grain was light. At Tallawang the sheep showed a distinct preference for Mulga over Belar. From June to August a 15-acre paddock of oats was grazed for seventy-seven days at intervals. For this period it carried over eleven sheep per acre, equivalent to five sheep per acre for the six months the crop occupied the ground. After grazing by horses a fair bulk of green stubble was ploughed in. At Baradine the sheep left the wheat and grazed the oats until bare before returning to the wheat.

Belar, Guyra and Mulga proved the best all-round varieties. Palestine, being a very early maturer, is not suited to the cooler parts of the district unless fed off until late in the season or sown late. It was badly frosted again this year at Purlewaugh and gave a low yield. White Tartarian was tried this season for the first time at Purlewaugh, but proved far too late. Following the December rains it produced a second-growth crop, which did not mature until the close of the year.

CULTURAL Details and Yields of Oat Variety Trials, 1931.

District	Baradine.	Baradine.	Baradine.	Purlewaugh.	Coolah.
Experimenter... ...	G. Hotchkiss, "Anawa."	R. Johns, "Ule-Wallen."	L. A. Hatton, "Cumberdeen."	F. Corderoy, "Pilton."	R. G. Norris, "Morven."
Nature of soil... ...	See Wheat trials.	See Wheat trials.	Light-brown loam.	Medium heavy red loam.	Medium red loam.
Ploughing	" ...	" ...	Disced 3 inches February.	Disced 3 inches October.	Disced 4 inches October.
Cultivation	" ...	...	Sown with combine.	Scarified March, April, sown with disc drill.	Scarified March, sown with combine.
Date o fsowing ...	8 May.	11 April.	18 March.	13 April.	11 June.
Seed per acre ...	50 lb.	60 lb.	60 lb.	50 lb.	50 lb.
Superphosphate per acre.	42 lb.	Nil.	Nil.	Nil.	Nil.
After treatment ...	......	......	Fed off heavily until August.	Not fed off.	Not fed off.
Remarks	Later maturing varieties affected by dry weather.	Water-logged...	Buddah and Mulga faulty germation.	White Tartartarian very late. Palestine frosted.	.....
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	......	......	......	38 32	......
Belar	25 28	7 20	......	43 35	28 20
Buddah	......	......	15 27	......	......
Gidgee	......	17 37	21 12	......	......
Guyra	29 15	......	......	34 21	28 29
Lachlan	......	......	......	33 1	......
Mulga	34 35	11 22	16 21	......	22 38
Palestine	30 22	......	27 8	17 13	32 5
Sunrise	......	13 29	......	......	......
White Tartarian ...	......	......	......	24 34	......

Temora District.

L. JUDD, H.D.A., Manager, Temora Experiment Farm, and District Instructor.

Following the dry winter and spring of 1930 and the late summer of 1931, conditions during March and April gave promise of a wonderful season. The conditions were ideal for sowing during the latter part of April, and the crops sown during that month germinated excellently. The excessive precipitations received in May made sowing in that month, except in isolated cases, a difficult matter, and it was only on the higher and better drained country that sowing could be effected. The position became worse in June, and in some cases the early-maturing varieties could not be sown. Even where sowings did take place the water-logged condition of the soil resulted in a poor germination, and was followed by an equally unsatisfactory growth. The position may have been somewhat relieved had decent spring rains been recorded, but unfortunately the spring proved dry. In fact, the lack of suitable rains following the water-logging had a very detrimental effect even on the early-sown crops, which during the early stages had made wonderful growth. Except in isolated cases good weather prevailed during harvest and little delay was experienced.

RAINFALL Records, 1930-1931.

	Eurongilly.	Marrina.	Marrar.	Trungley.	Dirnaseer.	Brilbarree.	Thuddungra.	Kingsvale.	Muttama.	North Berry Jerry.
	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.
1930.					*Rainfall on Fallow.*					
June ...	...	...	153	...	...	...	...	...	...	...
July ...	...	127	96	...	...	...	...	...	...	...
August ...	296	311	326	247	217	10	198	238	...	326
September ...	89	108	76	72	61	82	86	80	90	76
October ...	422	454	326	417	362	432	396	504	442	326
November ...	134	143	88	118	75	71	128	82	124	88
December ...	267	203	480	339	332	178	243	285	178	480
1931.										
January ...	129	147	51	159	118	218	84	87	45	51
February ...	73	27	35	...	46	7	...	14	111	35
March ...	187	306	452	345	355	405	458	505	394	452
Total on Fallow ...	1,597	1,826	2,083	1,697	1,566	1,403	1,593	1,795	1,384	1,834
1931.					*Rainfall on Growing Crop.*					
April	323	380	226	365	334	306	294	226	187	Not Available.
May... ...	568	741	571	651	644	528	333	594	681	
June... ...	656	618	668	582	640	468	361	909	708	
July... ...	112	132	88	164	189	220	225	167	225	
August ...	90	141	91	123	104	134	127	125	5	
September ...	285	191	100	114	112	111	96	187	255	
October ...	49	55	54	37	16	53	96	13	50	
November ...	201	150	168	120	173	168	187	246	210	
Total on Crop	2,284	2,408	1,966	2,156	2,212	1,988	1,719	2,467	2,321	

Wheat Variety, Fertiliser and Seeding Trials.

Good samples of grain were secured at all centres despite the unsatisfactory season.

Ford was undoubtedly outstanding this year, and is deserving of further trial. Its disease resistance in no small measure compensates for any slight weakness of straw.

Bobin was superior to Waratah, and promises to threaten the popularity of that variety. The wet conditions undoubtedly disadvantaged Nabawa, but previous performances are too well remembered to shake confidence in this variety.

Baringa was severely affected by loose smut.

Factors Influencing Yields.

Eurongilly.—Penny and Exquisite showed weakness of straw at harvest, in the latter case the heads showing a tendency to break off at the first joint, thus reducing the yield. Early maturers did not germinate well, and growth throughout was unsatisfactory.

Marrina.—Yields in both sowings were materially affected by dry spring conditions. Early maturers germinated badly, and made poor growth. Ford was most promising right throughout growth.

Marrar.—Heavy rain following sowing materially affected the Yandilla King Plots, the soil setting and causing poor germination. In the case of plot receiving 112 lb. superphosphate, rabbits reduced the yield somewhat. Both Waratah and Bobin shelled sufficiently to reduce yields to some extent.

Trungley.—All plots were affected by water-logging of the soil. Early maturers could not be sown.

Yannawah.—Similar conditions to Trungley prevailed.

Bribbaree.—Conditions were too wet on the clay land for heavy yields; all varieties suffered. Ford was outstanding in its ability to withstand the adverse conditions right throughout growth. It lodged in places, but combed out nicely at harvesting. Nabawa was slightly rotten in the straw when harvested. Conditions were too wet here to make sowings of early maturers.

Kingsvale.—The sowing here was unduly late. Poor germination followed sowing, and equally unsatisfactory growth followed. Cadia germinated best.

Muttama.—Excessive water-logging reduced the yield.

The Oat Trials.

Eurongilly.—In considering the results of the manurial trials it has to be remembered that they were conducted on new ground and in a season of more than bountiful rainfall. Belar stood out for straw strength, eclipsing Algerian in this respect. Palestine was very rotten in the straw, closely followed by Mulga.

Results of Wheat Variety, Manurial, and Seeding Trials.

District	Eurongilly.	Marrina.	Marrar.	Dirnaseer.	Trungley.	Yannawah.	Bribbaree.	Thuddungra.	Kingsvale.	Muttama.
Experimenter ...	Brabbin Bros.	E. Edwards.	J. Stevenson.	D. Adamson.	A. Krause.	A. Smithers.	T. West.	C. Ballard.	G. Coddington	H. Rumble.
Nature of soil ...	Medium red loam.	Red loam from granite.	Light granite loam.	Red loam ...	Clay loam ...	Red loam ...	Heavy clay loam.	Red loam ...	Light granite loam.	Silty loam.
Ploughing	Mouldboard, 4 inches, August.	Mouldboard, 5 inches, June.	Mouldboard, 4½ inches, June.	Mouldboard, 4 inches, August.	Mouldboard, 4 inches, August.	Mouldboard, August.	Mouldboard, 3 inches, August.	Mouldboard, August.	Mouldboard, 4 inches, August.	Mouldboard 5 inches, September.
Cultivation ...	Harrowed September, springtoothed October, combined October, springtoothed April, sown with combine. Late sown varieties springtoothed May and sown with combine.	Springtoothed August, harrowed September, portion disced and portion springtoothed February.	Scarified October, disced February, scarified February, springtoothed March, sown with combine.	Harrowed October, springtoothed January, April and May, combine sown.	Springtoothed October, disced January, portion disced and portion springtoothed March and April and sown with combine.	Harrowed December, combined February, scarified May (twice), sown with combine.	Springtoothed October and April, sown with combine.	Harrowed September, springtoothed June, harrowed March, springtoothed May.	Springtoothed November, and January, skim-ploughed January, springtoothed February, skim-ploughed July and harrowed.	Harrowed October, disced February, sown with combine.
Date of sowing ...	20-21 April, 25 May.	16-17 April, 6 May.	21-22 May.	6 May.	28 April, 3 August.	21 May	6-7 May	25 May	26 July	12 May.
Seed per acre ...	65 lb.	67 lb.	65 lb.	65 lb.	65 lb.	65 lb.	60 lb.	60 lb.	60 lb.	60 lb.
Superphosphate per acre.	84 lb.	84 lb.	84 lb.	56 lb.	84 lb.	84 lb.	84 lb.	84 lb.	60 lb.	84 lb.
After treatment ...	Fed off.	......	......	......	......	......	......	......	......	......
Remarks	Baringa heavily infected loose smut.	Baringa infected loose smut.	Yandilla King plots crusted after sowing; thin stand.	Baringa infected loose smut.	Baringa infected loose smut.	Baringa infected loose smut.	Baringa infected loose smut.	......	Poor germination throughout.	Plots waterlogged.

Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Yandilla King	26 25	23 38	21 4	25 23	18 7	24 25	24 19	35 2	......	20 17
Exquisite	20 36	29 57	......	......	......	......	......	35 30	......	......
Penny	25 16	29 39	......	30 7	17 51	......	......	......	5 15	......
Gallipoli	24 0	27 48	26 40	26 9	18 1	28 7	28 33	37 57	......	21 55
Baringa	15 56	24 53	28 50	27 21	17 30	26 51	17 56	36 33	......	......
Union	24 11	26 53	26 50	......	15 6	22 36	21 47	......	......	......
Nabawa	17 51	25 57	27 7	27 29	12 28	22 44	16 37	......	......	......
Bena	......	27 34	......	......	......	19 10	......	38 8	6 31	......
Ford	......	28 50	......	31 22	......	22 20	28 6	......	......	26 26
Marshall's No. 3 ...	......	......	22 5	25 56	......	......	......	......	6 22	22 47
Duchess	......	......	......	29 29	......	......	17 13	......	......	......
Dundee	......	......	......	......	15 20	......	......	......	......	......
Sepoy	......	......	......	......	18 36	......	......	......	......	......
Currawa	......	......	......	......	......	......	......	40 1	......	......
Cadia	......	......	......	......	......	......	......	32 10	7 2	18 43
Canimbla	......	......	......	......	......	......	......	......	4 27	24 19
Early Maturing Varieties.										
Waratah	13 54	8 15	27 43	27 4	......	24 48	......	......	......	......
Bobin	21 0	9 40	33 39	32 14	......	Nil.	......	......	......	......
Gullen	Nil.	Nil.	Nil.	Nil.	......	16 45	......	......	......	......
*Manurial Trials.**										
Superphosphate per acre—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
112 lb.... ...	28 39	19 29	18 57	26 45	17 44	26 21	21 34	Nil.	5 52	22 15
84 lb.... ...	26 25	22 29	21 4	25 23	18 7	24 25	24 19	Nil.	3 46	20 17
56 lb.... ...	28 0	20 30	19 43	25 50	17 10	20 16	22 13	Nil.	Nil.	19 55
Seeding Trials.										
Seed per acre— Marshall's No. 3—		bus. lb.							bus. lb.	
75 lb.	......	......	......	......	......	......	......	......	6 36	......
60 lb.	......	......	......	......	......	......	......	......	6 22	......
Yandilla King—										
67 lb.	......	23 38	......	......	......	......	......	......	......	......
55 lb.	......	22 29	......	......	......	......	......	......	......	......

* Yandilla King was the variety used in these trials.

Marrina.—Mulga stooled very little, and again demonstrated its weakness of straw, Gidgee being far superior in this respect. Belar, Guyra, and Algerian stood up well, and the straw was excellent to strip.

North Berry Jerry.—Sowing was extremely late and growth stunted. Mulga was very weak in the straw and stooled very little. On account of the lateness of sowing, Palestine had a decided advantage over Algerian.

Thuddungra.—Loss occurred in all varieties through the heads being dead ripe although the straw was almost too green to thresh. Mulga, Palestine, and Buddah were rotten in the straw. Shedding took place in all plots, Gidgee and Palestine being superior to the other varieties in this respect.

Muttama.—The excessively wet conditions affected germination of all plots, whch were thin and badly set back in growth. The water-logged condition of the soil materially reduced yields.

YIELDS in the Oat Variety, Fertiliser, and Seeding Trials.

District	Eurongilly.	Marrina.	North Berry Jerry.	Thuddungra.	Muttama.
Experimenter... ...	S. Cooper.	E. Edwards.	T. Lewis.	D. Watson.	H. Rumble.
Nature of soil... ...	Heavy clay loam.	Red loam ...	Light loam ...	Medium red loam.	Silty loam.
Ploughing	Mouldboard, 4 ins., August.	Mouldboard, 5 ins., June.	Scarified, 3½ ins., August.	Mouldboard, 4½ ins., August.	Mouldboard, 4 ins., February.
Cultivation	Harrowed October, disced March, springtoothed April, sown with combine.	Springtoothed August, harrowed September, disced February, combine sown.	Scarified November, January, and March, springtoothed June, skim-ploughed July.	Scarified November, sundercut March, combine sown.	Sown with combine with covering harrows.
Date of sowing ...	19 April.	17 April.	25–27 July.	22 May.	5 May.
Seed per acre ...	60 lb.	60 lb.	60 lb.	65 lb.	60 lb.
Superphosphate per acre	56 lb.	56 lb.	56 lb.	60 lb.	60 lb.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	48 37	39 8	6 35	......	17 0
Belar	50 0	38 10	11 37	......	11 20
Palestine	55 7	......	14 13	50 34	......
Mulga	48 9	31 17	9 4	31 36	......
Gidgee	38 19	27 20	9 25	15 24	......
Guyra	......	39 3	10 9	......	10 28
Buddah	......	......	......	29 30	......
Sunrise	......	......	......	33 31	......
Lachlan	......	......	......	......	11 15
Manurial Trial.					
Superphosphate per acre—	bus. lb.	bus. lb.	bus. lb.		
84 lb.	......	40 10	10 1	......	......
70 „	26 0	......	......	......	......
56 „	40 25	39 8	9 4	......	......
No manure ...	39 11	38 6	12 0	......	......
Rate of Seeding Trial.					
Seed per acre—	bus. lb.				
40 lb.	29 10	......	......	......	......
50 „	40 25	......	......	......	......
60 „	48 9	......	......	......	......

* In this trial Mulga was the variety used at Eurongilly and North Berry Jerry, and Algerian at Marrina.

nemas had transferred to the prairie grass from the lucerne, and as artificial transfers of this sort are not easily done the observations were of considerable interest.

Fig. 1.—Portions of Lucerne Plant affected with Stem Nematode.

Showing the discoloured, swollen and distorted condition of the young shoots and the death of the older stems.

Fig. 2—Lucerne Stems Affected with Stem Nematode.

Showing the clustering of the leaves towards the ends of the shoots, the discoloured stems and the splitting and flaking off of the epidermis.

Symptoms of the Disease.

The usual symptoms of infestation with *Tylenchus dipsaci* constitute a marked dwarfing and distortion of the whole plant, together with localised hypertrophy of the tissues. Occasionally chlorosis is evident, and the stems may split open or present a blister-like appearance. The organism normally confines its attack to the above-ground parts, and the roots are never entered.

In lucerne the stem nematode disease is characterised by a thinning-out of the stand in localised areas throughout the field. The affected areas make very little growth and are usually very slow in recovering after cutting, and invariably fail to make any appreciable new growth in the spring. In the early stages of the disease a wilting of some of the stems may be observed, but generally the affected plants present a typical dwarfed and distorted appearance. There is a marked reduction in the number of stems and the leaves are often clustered together towards the ends of the diseased shoots. The stems become swollen and generally show a distinct brownish discolouration, which is very marked towards the base, although in many cases it extends up the stem for some considerable distance.

Occasionally, localised brownish discoloured areas are evident at the base of the stipules and apparently represent separate points of infestation. Frequently the whole of the internodal tissues become infested for some distance above ground level, and when split open longitudinally the stems present a browned and decayed appearance. The affected stems may have a blistered appearance owing to the epidermal cells becoming much lighter in colour and tending to flake off. In other cases the stems crack and split open longitudinally. Generally, affected stems are very brittle and easily broken off. The new buds arising from the crowns of affected plants are usually swollen, spongy in texture and yellowish-brown in colour. Frequently the buds are killed right out, but in other cases they remain dormant for several months before making any growth. In cases of severe infestation the crowns rot away and the plants eventually die out, leaving a stand of unprofitable thinness which rapidly becomes overgrown with weeds and grasses.

The Causal Organism—Historical.

The stem nematode was first described and named by Kuhn([20]) in 1858. He found nematodes occurring in large numbers in the diseased inflorescences of the teasel (*Dipsacus fullonum*) and named the species *Anguillula dipsaci*. Gervais and Van Beneden([12]) in 1859 published an account of the nematode causing "cockles" in wheat and also the form found by Kuhn in the teasel in the previous year, and named them, respectively, *Anguillulina tritici* and *Anguillulina dipsaci*. Later when it become known that the nematode found by Kuhn in the teasel likewise produced a disease in oats, buckwheat and a number of other plants, Kuhn considered his original name of *Anguillula dipsaci* to be too restricted, and changed it to *Anguillula devastatrix*. Bastian ([1]) in 1865 divided the old genus of Anguillula into

North-western District.

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Wheat and oat variety trials, together with fertiliser and rate of seeding tests with wheat, were conducted throughout the north-west during the season 1931-32. Practically all the trials were carried out on short summer fallow, the others being on winter fallows and on land which had carried oats (fed off) the previous season.

The Season.

Rainfall table and comment on the season are given in the author's report on the wheat crop-growing competitions in this district (see page of this issue).

The most prevalent disease was foot rot, which no doubt was encouraged by the moist conditions during the winter. The disease showed up at a late period in the plants' growth. Take-all was also present. Flag smut was not very noticeable this season, even very susceptible varieties escaping infection. Damage from rust might have been extensive only that seasonal conditions were not suitable for its development.

The Wheat Variety Trials.

All varieties behaved satisfactorily this season. Nabawa perhaps could have done better, its slight falling off this season owing to excessive moisture during the winter coming as a surprise on account of its very successful showing during past years. However, the reduction in yield in Nabawa this season from the moisture factor is slight compared with the loss occasioned by farmers using varieties which are susceptible to flag smut and rust. Nabawa will still maintain its place among the varieties suitable for the north-west.

Wandilla yielded well where tried with Ford and Nabawa, but last season it was almost a total failure owing to its liability to rust. Varieties such as this, which will fail completely owing to disease, are not deserving of serious consideration.

Geeralying shelled in some localities and in others yielded particularly well. Apparently it will not stand very well after rain when ripe. Its resistance to flag smut is a big factor in its favour, but it will have to be tried further in the district. In the trials it yielded better than Clarendon, and should prove a keen rival to that variety in this district.

Ford mostly yielded better than Nabawa. The latter variety suffered from the wet winter conditions. Ford's ability to yield well and its comparative resistance to flag smut and rust make it a most valuable variety for the north-west. It is a mid-season maturing variety, and must be sown early in April in this district.

Baringa was tried in one experiment at Delungra, and demonstrated its ability to yield well. It was affected by loose smut.

CULTURAL Details and Yields

District ...	Curlewis.	Kelvin.	Curlewis.	Emerald Hill.	Gunnedah.	Emerald Hill.	Gunnedah.
Experimenter ...	W. O. Manning, "The Pines."	J. Barwick, "Carslian."	F. McClintock, "Tilbrook."	F Shaw, "Biwoadah."	F. Adams, "Collybee."	E. S. Perrett, "Kilruden."	D. Perrett, "Wanda."
Nature of soil ...	Gravelly loam.	Gritty to chocolate loam.	Chocolate loam	Heavy chocolate.	Red loam ...	Heavy chocolate.	Chocolate loam
Ploughing ...	....	Disced March	Disced March	....	......	Disced January, 1930.	....
Cultivation ...	Springtoothed December, 1930, again February, harrowed March, sown with combine.	Harrowed prior to sowing with combine.	Disc ploughed and springtoothed April, sown with combine.	Rigid scarified January, 1930, harrowed March, springtoothed March, harrowed April, sown with combine.	Springtoothed February, 1930, harrowed March, sown with combine.	Springtoothed March, also April, combine sown.	Springtoothed, March, April and May, 1930 sown with combine.
Date of sowing...	15 April.	4 May.	26 April.	5 May.	28 April.	18 May.	7 May.
Seed per acre ...	40 lb.	45 lb.	50 lb.	43 lb.	48 lb.	45 lb.	48 lb.
Superphosphate per acre ...	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks ...	....	....	....	Land waterlogged in patches.	....	....	....
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie ...	28 37	....	33 24	30 12	27 52	....	....
Barwang ...	....	....	....	....	....	....	....
Bena ...	....	....	....	....	....	....	17 18
Burril ...	....	28 4	....	31 20	....	....	....
Cadia ...	....	....	....	....	....	....	....
Canberra ...	....	....	....	....	....	23 34	....
Canimbla ...	....	....	....	....	....	....	....
Clarendon ...	23 31	24 45	24 21	29 41	28 40	24 49	....
Cleveland ...	....	....	....	....	....	....	....
Currawa ...	....	....	....	....	....	....	....
Duri ...	20 13	31 53	37 37	42 30	24 19	27 9	....
Early Bird ...	21 50	31 9	....	....	....	25 47	....
Ford ...	30 39	29 51	39 1	32 19	26 44	25 51	31 19
Geeralying ...	27 47	32 22	....	30 2	28 40	24 16	26 21
Gluyas Early ...	....	....	18 39	....	....	....	22 47
Gresley ...	....	....	....	....	19 3	....	....
Hard Federation	....	....	....	....	21 56	....	....
Lawson ...	....	....	24 43	....	....	....	22 15
Nabawa ...	24 21	26 8	27 8	33 57	26 37	21 32	24 51
Onas ...	....	....	....	....	....	....	....
Pusa ...	....	....	....	....	....	....	....
Queen Fan ...	....	....	....	....	....	....	....
Rajah ...	24 36	....	....	....	....	....	....
Ranee ...	....	....	23 41	....	....	....	....
Wandilla ...	....	....	....	....	....	....	26 56
Waratah ...	25 26	32 3	33 59	32 33	28 54	29 36	28 9

District ...	Pallamallawa.	Moree.	Bingara.	Bingara.	Delungra.	Inverell.	Inverell.
Experimenter ...	S. Rigby, "Gwyroi."	J. McDonald, "Bonnie Doon."	C. Batterham, "Orban."	G. L. Howson, "Black Rock."	A. M. Paterson, "Green Hills."	G. S. Makin, "Carrawarra," Gum Flat.	E. Rankins, "Oakwood."
Nature of soil ...	Grey loam ...	Grey loam ...	Chocolate loam	Chocolate loam	Black basaltic loam.	Black basaltic loam.	Black basaltic loam.
Ploughing ...	Disced March.	Scarified February.	Disced March, 1931.	Disced November.	......	Mouldboard June.	Mouldboard January.
Cultivation ...	Rigid scarified May, combine sown.	Scarified April, sown with combine.	Springtoothed prior to sowing with combine.	Springtoothed April, again May, and sown with springtooth cultivator.	Springtoothed February, mouldboard ploughed May and harrowed, mouldboard ploughed June, sown with combine.	Combine sown.	Mouldboard ploughed February, rigid scarified April and May, combine sown.
Date of sowing...	10 June.	3 June.	20 May	23 May.	18 July.	14 July.	11 June.
Seed per acre ...	45 lb.	45 lb.	48 lb.	55 lb.	50 lb.	58 lb.	60 lb.
Superphosphate per acre ...	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie ...	48 24	24 24	30 58	32 51	....	31 2	30 20
Barwang ...	....	....	....	....	45 46	....	....
Bena ...	....	10 0	....	22 57	33 8	....	....
Burril ...	....	....	....	....	31 45	....	....
Cadia ...	....	....	....	....	32 33	26 23	28 39
Canberra ...	....	....	26 5	....	....	....	....
Canimbla ...	....	....	....	....	....	....	18 39
Clarendon ...	38 1	21 23	29 6	....	....	24 26	18 33
Cleveland ...	....	....	....	....	....	24 26	30 30
Currawa ...	....	....	....	....	....	....	....
Duri ...	42 42	24 21	37 52	32 21	41 44	....	....
Early Bird ...	38 33	18 57	....	....	....	....	....
Ford ...	48 52	16 53	37 21	35 39	48 38	26 44	30 30
Geeralying ...	47 7	18 30	39 29	27 16	30 59	29 44	14 35
Gluyas Early ...	....	....	....	....	....	....	....
Gresley ...	....	....	....	....	....	....	....
Hard Federation	....	....	34 25	....	....	....	....
Lawson ...	....	....	....	26 26	....	27 26	30 30
Nabawa ...	44 17	13 4	28 15	29 5	34 5	29 53	26 48
Onas ...	....	....	....	....	....	....	....
Pusa ...	....	....	....	....	....	....	....
Queen Fan ...	....	....	....	....	17 25	20 41	....
Rajah ...	36 36	....	....	....	....	....	....
Ranee ...	40 52	....	26 3	....	....	....	....
Wandilla ...	....	....	....	....	....	....	....
Waratah ...	44 27	17 7	34 26	23 29	30 14	24 54	29 26

of Wheat Variety Trials.

Tambar Springs. J. P. Weis, "Leona Downs."	Narrabri. D. Seccombe, "Yarila."	Boggabri. C. Abbott, "Herndale."	Baan Baa. L. T. Latham, "Burragarrum."	Narrabri. J. Houguet, Nuable Creek.	Wee Waa. J. Newnham, "Redlands."	Pilliga. J. Miller-Williams, "Tewkesbury."	Bellata. J. A. Brooke, "Rockdale."
Sandy loam ...	Sandy loam ...	Sandy loam ...	Red to chocolate.	Grey loam ...	Red sandy loam.	Sandy loam ...	Gravelly chocolate loam.
Disced March. Harrowed prior to sowing with combine.	Disced April. Springtoothed April, combine sown.	Disced January, 1931. Springtoothed February, March, and April, disc cultivated May, springtoothed May and June, sown with springtooth cultivator.	Disced December. Springtoothed March, harrowed May, half cross-harrowed, combine sown.	Mouldboard January, 1931. Mouldboard ploughed February, springtoothed April, combine sown.	Disced September. Springtoothed twice October, disc ploughed March, 1931, springtoothed April, combine sown.	Disced April. Combine sown	Disced January, 1930. Springtoothed three times prior to sowing with a combine.
20 May.	7 May.	23 June.	3 June.	29 April.	17 April	20 May.	22 April
45 lb.	45 lb.	45 lb.	45 lb.	45 lb.	40 lb.	45 lb.	48 lb.
Nil.	Nil.	Nil.	Nil.	Nil.	Nil	Nil.	Nil
....	....	....	....	....	....	....	....
bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
16 15	....	23 35	....	24 24	33 0	....	25 3
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
....	24 0	....	....	....	....	....	....
....	....	....	....	....	....	....	....
12 55	....	25 50	14 47	18 41	....	21 30	24 25
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
....	36 0	....	13 15	24 13	24 53	24 35	26 26
18 47	....	....	....	....	....	....	....
16 8	....	....	11 46	24 51	34 32	....	24 24
17 28	....	22 43	13 7	22 23	23 41	21 15	34 56
....	....	....	....	24 44	28 16	....	22 28
....	....	....	....	....	....	....	....
....	....	....	14 18	31 20	30 17	24 10	....
....	....	....	....	....	....	....	....
16 22	....	....	10 44	27 50	33 25	24 20	22 35
....	....	....	....	....	....	....	....
....	....	....	13 20	....	....	....	....
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
12 0	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
17 9	28 0	....	16 54	24 47	28 21	21 41	31 12

Inverell. M. C. Cosker Bros., Cherry Tree Hill.	Gunnedah. H. Gardner, "Lochlea," Milroy.	Boggabri. F. Penfold, Bluevale.	Boggabri. J. B. White, Braymont.	Narrabri. R. Smith, "Kia-Ora."	Inverell. H. Scott, Hawthorndale, Nullamanna.	Inverell. W. T. Taylor, Mont Vidier, Rob Roy.	Boggabri. J. A. Laird, Willowdale.
Red loam	Sandy loam	Chocolate, gravelly loam.	Chocolate, gravelly loam.	Sandy loam ...	Chocolate loam	Black basaltic loam.	Medium loam
Mouldboard January. Mouldboard ploughed April, combine sown.	Disced January. Springtoothed March and April.	Mouldboard December. Springtoothed March, sown with combine.	Disced August. Springtoothed October and December, also March, half cross-springtoothed March, sown with combine.	Disced February. Springtoothed April, sown with disc drill.	Disced April, 1930. Harrowed June, springtoothed August, September, October, and November, 1930, and in January and March, 1931, harrowed April, combine sown.	.... Springtoothed May, 1931, Mouldboard ploughed July, combine sown.	Disced February. Disc-ploughed May, 1931, sown with disc drill.
5 June.	22 May.	Early varieties sown 17 May, 1931, late 27 April, 1931.	1 May.	22 May.	8 May.	15 August.	20 May
45 lb.	50 lb.	45 lb.	48 lb.	45 lb.	30 lb.	60 lb.	45 lb.
Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
19 6	16 15	....	....	27 11	....	20 24	....
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
18 43	....	....	....	....	35 11	16 30	....
....	....	27 50	31 2	21 3	....	....	....
19 53	....	25 51	30 38	....	34 4	23 28	....
19 0	....	....	....	....	....	31 20	21 33
18 46	....	....	....	....	26 3	15 0	....
....	....	25 45	29 2	....	....	23 40	....
17 7	16 30	29 28	37 4	21 56	30 20	....	14 43
....	....	27 33	32 9	....	....	....	....
16 21	....	26 2	25 31	22 48	32 6	25 40	27 36
17 15	12 12	24 45	38 51	....	29 50	16 40	17 4
....	....	26 47	31 41	....	....	....	....
....	....	....	....	15 47	....	....	....
....	13 7	....	....	21 3	....	....	16 14
....	....	22 0	....	....	....	29 20	....
18 16	12 51	25 27	24 30	17 32	29 12	24 0	17 9
....	18 11	....	....	....	....	....	....
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
....	14 34	....	....	....	....	....	....
....	....	....	....	15 47	22 1	....	....
....	....	27 30	27 1	....	....	....	....
18 48	15 45	32 58	29 59	16 40	23 29	21 20	18 17

Burrill was tried a few times, and appears as though it will yield satisfactorily. It has strong straw, but is inclined to flag smut infection. Lawson also promises to do well, and will be tried further.

On this year's results there does not appear to be much difference in the yield of Currawa and Canimbla. Further comparison will be necessary to determine which is the more suitable for north-western conditions.

Duri, Aussie, and Waratah yielded very well, there being only a slight infection of flag smut. These are useful varieties for the north-west.

Wheat Rate of Seeding Tests.

Trials to determine the most suitable quantities of seed per acre to use in the north-west were carried out by Mr. C. Anderson, Swan Vale, Inverell, and Mr. A. Gett, Glenville, Narrabri. On Mr. Anderson's property the soil is a chocolate loam and the plot had grown wheat in 1930. It was mouldboard ploughed in February, 1931, harrowed March, springtoothed April and May, harrowed May, and combine sown on 6th June without fertiliser.

The soil on Mr. Gett's plot is light loam, which had also grown wheat the previous year. It was disc ploughed January, 1931, springtoothed March, disc cultivated April, and sown with a disc drill on 30th April without fertiliser.

RESULTS of Rate of Seeding Trials.

Seed Per Acre.	Inverell. (Nabawa variety.)	Narrabri. (Waratah variety.)
	bus. lb.	bus. lb.
30 lb.	48 14	20 30
45 lb.	....	21 20
48 lb.	52 31	....
58 lb.	44 54	....
60 lb.	....	23 40

The plots were affected by frosts after the mild winter, damage being most apparent in the thinner sown plots.

Generally in the north-west it is found that a medium rate of seeding gives the best results; 40 lb. for early sowing, 45 up to 50 lb. for mid-season sowing, and 55 to 60 lb. per acre for late sowing.

Fertiliser Trials with Wheat.

Trials carried out in co-operation with Messrs. J. C. Wood, of Curlewis, D. A. Lilybridge, of Narrabri West, and T. E. A. Hubbard, Gunnedah, showed only slight advantage from the use of superphosphate, and, moreover, the increases in yields were not consistent with the amounts of fertiliser applied. Further trials will be necessary before a definite statement as to the use of superphosphate in the north-west can be made.

Cultural Details and Yields of Oat Variety Trials, 1931.

District	Curlewis.	Kelvin.	Boggabri.	Baan Baa.	Narrabri.	Wee Waa.	Bingara.
Experimenter	J Cavanagh, "Roanoak"	J. E. Peachey "Clear View"	F. W Tait, Rose Vale.	L. T. Latham, Burra-garrum.	A F. Richard, Snowden	J Newham. "Redland."	G. L. Howson, Black Rock.
Nature of soil	Chocolate loam.	Chocolate loam.	Sandy loam.	Red, chocolate loam.	Silty loam ..	Red sandy loam	Chocolate loam.
Ploughing	......	Disced February.	Disced February	Disced December	Disced February.	Disced September.	Disced January
Cultivation	Rigid scarified March and April, sown with combine.	Harrowed March, spring-toothed April, combine sown	Spring-toothed March, disc-cultivated prior to sowing with combine.	Spring-toothed March, disc-harrowed May, half cross-harrowed May, sown with combine.	Spring toothed March, twice April, and again May, sown with combine	Spring-toothed twice October, disc ploughed March, spring-toothed April, sown with disc drill.	Disc ploughed April, sown with springtooth cultivator.
Date of sowing	15 May.	9 May.	11 May.	4 June.	1 June.	18 April	18 May.
Seed per acre	40 lb.	33 lb.	40 lb	50 lb	40 lb	40 lb.	40 lb.
Superphosphate per acre	Nil	Nil.	Nil	Nil.	Nil.	Nil.	Nil.
Remarks	......	......	......	......	......	Mulga lodged badly.	Mulga lodged
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus lb.	bus. lb
Algerian	35 35	26 26	......	15 23	23 0	39 26	25 35
Belar	36 19	35 34	......	14 32	......	53 31	......
Buddah	......	......	24 0	......	......	......	38 1
Burke	......	......	......	......	......	......	......
Gidgee	31 18	......	20 0	......	......	35 6	......
Guyra	50 20	......	37 27	7 10	14 27	36 0	23 3
Kendall	......	......	......	14 3	......	......	29 16
Lachlan	32 19	29 13	20 0	10 20	......	......	28 0
Laggan	......	......	......	......	......	......	......
Mulga	41 23	......	9 13	18 24	......	27 27	14 18
Palestine	41 1	39 23	38 26	......	......	......	......
Reid	......	......	......	......	......	......	......
Sunrise	......	......	......	......	......	......	......

District	Mt Russell.	Inverell.	Boggabri.	Boggabri.	Boggabri.	Boggabri.
Experimenter	F Mills, "Dalkey."	B McCosker, Bannockburn.	F Penfold, "Bluevale"	J B White, "Braymont"	J. Langlers, Strathmore	J. A. Laird, Willowdale.
Nature of soil	Red to chocolate loam.	Red loam ...	Gravelly, chocolate loam.	Clay loam ...	Chocolate loam.	Sandy loam
Ploughing	Mouldboard February.	Mouldboard July.	Mouldboard December	Disced March.	Disced April	Disced February.
Cultivation	Scarified June, sown with combine.	Disc ploughed October, harrowed January, rigid-tined March, spring-toothed April, sown with combine.	Spring-toothed March, sown with combine	Sown with combine	Spring-toothed April, sown with disc drill.	Spring-toothed May, sown with combine.
Date of sowing	11 June.	27 April.	27 April.	11 April.	18 May.	25 May
Seed per acre	45 lb	48 lb.	40 lb.	40 lb.	40 lb.	40 lb.
Superphosphate per acre	Nil.	Nil.	Nil	Nil.	Nil.	Nil
Remarks	......	......	......	......	......	......
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	29 32	48 16	......	37 34	......	10 12
Belar	......	38 3	38 7	27 7	37 6	11 13
Buddah	......	......	41 3	22 28	36 4	......
Burke	47 26	......	......	......	......	......
Gidgee	......	......	39 29	27 14	39 9	11 30
Guyra	44 11	30 35	......	27 8	47 11	11 3
Kendall	......	......	......	......	......	......
Lachlan	23 12	39 11	......	18 30	20 13	......
Laggan	......	29 19	39 25	......	......	......
Mulga	38 16	......	30 35	16 37	......	11 19
Palestine	......	......	32 9	12 25	39 29	......
Reid	35 6	24 16	......	......	......	......
Sunrise	42 0	41 17	......	......	......	......

RESULTS of Wheat Fertiliser Trials.

Amount of Superphosphate Per Acre.	Curlewis.	Narrabri West.	Gunnedah.
	bus. lb.	bus. lb.	bus. lb.
32 lb.	....	....	14 57
35 lb.	....	18 0	....
40 lb.	40 25	....	....
50 lb.	....	21 0	....
61 lb.	....	....	14 58
75 lb.	....	24 0	....
80 lb.	....	....	14 39
No manure	34 17	18 0	13 28

The Oat Variety Trials.

Some of the oat varieties suffered by reason of shelling and lodging, but the results demonstrate that the early and mid-season varieties, such as Mulga, Buddah, Guyra, and Belar, are suitable for this district. Palestine proved itself a heavy yielder, but further tests are considered necessary. Burke, Kendal, and Laggan are worthy of further trial.

The practice of growing oats for grazing purposes cannot be too strongly recommended for this district, and the abovementioned varieties will give the most satisfactory results.

DIPPING EXPERIMENTS AT THE NEW ENGLAND EXPERIMENT FARM.

FOR some years it was found very difficult to maintain the flock at the New England Experiment Farm, Glen Innes, free from external parasites, particularly ked (tick). The farm is so situated that it runs considerable danger of infestation from without, being bounded on two sides by roads along which there is considerable stock traffic.

As, for other reasons, it had been decided to carry out a double dipping on this farm, the opportunity was taken to observe the effects of such treatment on the situation regarding external parasites. The actual treatment adopted was to dip the sheep off shears in a carbolic dip, and six weeks later dip in the usual arsenic dip. This treatment has been carried out for two years, and during that period no sign of external parasites has been found among the sheep on the farm. It would appear, therefore, that under the conditions existing at the New England Farm the double dipping is effective in maintaining the flock in a state of freedom from external parasites.—MAX HENRY, Chief Veterinary Surgeon.

EVERYTHING that contributes to cleaner udders, cleaner hands, cleaner clothes, cleaner structures, cleaner utensils, cleaner machinery, and cleaner atmosphere will assist towards the production of cleaner cream, and consequently a clean-flavoured butter—the only class of butter for which we may expect "repeat" orders to the extent the country needs them.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	Messrs. Coppleson and Kelly, Wee Waa.
Baringa	Mr. H. J. Harley, "Wattle Park," Tullibigeal.
Bobin	Manager, Experiment Farm, Condobolin.
	Mr. W. E. Ditchfield, "Strathmerton," West Wyalong.
	Mr. D. W. Edis, "Prestonville," Ariah Park.
	Mr. R. Penfold, Quandialla.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
	Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. B. J. Robards, "Plain View," Nevertire.
	Mr. H. J. Harley, "Wattle Park," Tullibigeal.
Bredbo	Manager, Experiment Farm, Cowra.
Canimbla	Manager, Experiment Farm, Cowra.
Clarendon	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Cleveland...	Mr. W. Burns, "Goongirwarrie," Carcoar.
Currawa	Manager, Experiment Farm, Temora.
Duri	Mr. M. Greenwood, Spring Ridge Road, Quirindi.
Exquisite	Manager, Experiment Farm, Cowra.
Geeralying	Mr. J. Parslow, "Cooya," Balladoran.
Gluyas Early	Manager, Experiment Farm, Temora.
Gullen	Mr. J. Parslow, "Cooya," Balladoran.
Nabawa	Mr. J. Parslow, "Cooya," Balladoran.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
	Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. B. J. Robards, "Plain View," Nevertire.
	Mr. H. J. Harley, "Wattle Park," Tullibigeal.
	Mr. W. G. Law, "Thistledown," Gilgandra.
	Mr. J. W. Watson, "Morvada," Merriwagga.
	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Nizam	Manager, Experiment Farm, Temora.
Queen Fan	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Rajah	Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. W. G. Law, "Thistledown," Gilgandra.
Sepoy	Manager, Experiment Farm, Temora.
Wandilla	Mr. W. G. Law, "Thistledown," Gilgandra.
	Manager, Experiment Farm, Cowra.

Wheat—continued.

Waratah	... Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Bathurst.
	Mr. R. M. Gelling, "Cooinoo," West Wyalong.
	Mr. Smith Pollock, "Glengarry," Quirindi.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
Yandilla King ...	... Manager, Experiment Farm, Temora.
	Mr. W. G. Law, "Thistledown," Gilgandra.

Oats—

Algerian	... Mr. S. W. Brien, "Glen Logan," Cowra.
	Mr. C. Bennett, "Theole," Forbes-road, Cowra.
Belar	... Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Cowra.
	Mr. C. Bennett, "Theole," Forbes-road, Cowra.
	Mr. C. W. Buckland, "Kangetong," Ootha.
	Mr. S. W. Brien, "Glen Logan," Cowra.
Gidgee	... Manager, Experiment Farm, Temora.
Guyra	... Manager, Experiment Farm, Bathurst.
	Messrs. Walker Bros., Wattamondara.
Lachlan	... Manager, Experiment Farm, Temora.
Mulga	... Manager, Experiment Farm, Temora.
	Mr. C. Bennett, "Theole," Forbes-road, Cowra.
	Mr. C. W. Buckland, "Kangetong," Ootha.
Palestine	... Mr. C. W. Buckland, "Kangetong," Ootha.
White Tartarian	... Manager, Experiment Farm, Bathurst.

Tomatoes—

Improved Sunnybrook Earliana ...	... Mr. Albert Sorby, Macquarie Fields.

Cucumbers—

Early Fortuna ...	... Mr. W. Parry, Terrigal.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Kempsey (E. E. Mitchell) ...	April 6, 7, 8	Macksville (P. R. Larkey)...	... April 26, 27
Taree (C. A. Jackson)	„ 7, 8, 9	Casino (E. J. Pollock) ...	... „ 27, 28
Bowraville (A. H. Newman) ...	„ 12, 13	Gresford (A. R. Brown) ...	... „ 29, 30
Orange (Geo. T. Williams) ...	„ 12, 13, 14	Trangie (F. H. Hayles) ...	... May 10, 11
Wingham (C. H. Blenkin) ...	„ 13, 14	Cootamundra Sheep Show (G. B. Black)	... July 20, 21
Wee Waa (P. Cant)	„ 13, 14	Berrigan (R. Wardrop) ...	... Sept. 28
Grafton (L. C. Lawson)	„ 13 to 16	Narrandera (J. D. Newth)	... Oct. 4, 5
Maclean (T. B. Natley)	„ 20, 21	Cootamundra (G. B. Black)	... „ 25, 26
Nabiac (E. A. Carey)	„ 21, 22		
Dubbo (F. W. K. Wise)	„ 26, 27		

No dairy farm can be regarded as safe from the trade point of view which has not a command of clean water convenient to the dairy, and also the means of boiling it in sufficient quantity for effective sterilisation of dairy utensils and machines.

Coastal Winter Fodder Trials.

The Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

WHERE conservation of fodder is not practised the growing of winter fodder crops is essential on the coast, and thorough preparation of the soil, selection of the right varieties for the district, and sowing at the correct time must be closely adhered to if the best results are to be obtained.

Trials with winter fodder crops were again conducted by the Department in co-operation with farmers in this district last year.

The Season.

The season was almost as unfavourable as the three preceding years. The very wet late summer and autumn, culminating in almost general floods in April, was responsible for delays both in the harvesting of summer crops and the preparation of the land for winter cereals, many farmers finding it impossible to get the plots in until too late, quite a number of sowings taking place after mid-May. Rain was recorded almost generally throughout the district in June and early July, but for the remainder of the season dry conditions prevailed, accompanied in the early spring months by much wind and some severe frosts.

Comment on the Results.

There was little to choose between Mulga and Sunrise oats, the latter probably giving better results on the majority of plots. Buddah did well, maturing earlier than the others, and at the same time giving a heavy yield of good succulent fodder, and consequently is strongly recommended.

In the mixed plots, Mulga and Sunrise in combination with either Gresley or Canberra have done well. The inclusion of legumes such as vetches and peas is not giving complete satisfaction owing to the almost total disappearance of the legume when the cereals make their dense spring growth. Instead of growing legumes in the mixture some farmers are adopting the practice of growing the cereal by itself and growing alongside a strip of peas or vetches (⅓ acre to every 2 acres of oats) and then mixing when cutting. French Grey and Lima peas and Woolly-podded vetch again did well.

In the fertiliser trials the application of superphosphate plus sulphate of ammonia gave greatly increased yields.

Yields of Lower North Coast Winter Fodders.

Crop.	F. Wheeldon, Gladstone. (Sown 2nd April.)	John Booth, Temagog. (Sown 12th April.)	James Eakin. (Sown 25th May.)	E. E. Booth, Austral Eden. (Sown 12th May.)	C. G. Sanders, Austral Eden. (Sown 6th May.)	D. W. Everson, Austral Eden. (Sown 4th June.)	T. J. Warren, Lansdowne. (Sown 25th May.)	R. Wilson, Rolland's Plains. (Sown 9th April.)	S. T. Boyd, Kendall. (Sown 30th March.)	C. L. Lee, Kendall. (Sown 27th March.)	G. Levick, Taree Estate. (Sown 6th May.)	E. Kingston, Bandon Grove. (Sown 20th May.)	E. H. Ducat, Temagog. (Sown 4th May.)	V. Heggarty, Bandon Grove. (Sown 20th May.)	T. Gallagher, Krambach. (Sown 11th June.)	J. L. Deer, Krambach. (Sown 19th May.)	J. Kellehear, Krambach. (Sown 21st May.)	J. P. Mooney, Dumaresque Is. (Sown 29th May.)	G. Germon, Fosterton. Sown 7th April.)	Bosworth Bros., Fosterton. (Sown 14th April.)	Alex Smith & Sons, Bandon Grove. (Sown 22nd May.)
	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.
Sunrise, Gresley, peas, and vetches ...	14	...	...	...	...	...	5	...	10	13	15	14	...	...	...	5½	5	...	...	11½	14½
Sunrise, Gresley, and peas	...	18	...	...	11½	9	...	...	...	...	...	...	...	11	...	...	...	14½	14	...	...
Sunrise and peas ...	...	16	15½	14	...	...	...	...	...	...	...	...	12	...	...	...	...	...	...	...	...
Sunrise	...	...	14½	...	...	...	5	...	...	...	...	...	...	...	7	...	...	...	...	...	...
Sunrise, Canberra, and peas	...	...	...	17½	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13
Sunrise, peas, and vetches	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14	...
Mulga, Canberra, peas, and vetches...	...	...	...	...	...	...	...	10½	...	...	14	...	...	...	...	...	...	...	...	...	14½
Mulga, Gresley, and peas	10	...	...	15½	10	...	6	...	...	...	...	11½	...	13	...	...	...	12½	9	...	15
Mulga	...	...	15	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mulga and peas ...	...	...	...	13½	...	7½	...	...	...	...	...	...	11¼	...	...	...	...	...	...	...	...
Buddah, Canberra, and peas	...	...	...	...	...	...	...	9½	...	...	...	...	...	...	8	7	6	...	...	...	...
Buddah, Gresley, and peas	12	...	...	...	12½	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Buddah	...	...	16½	...	12½	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Florence wheat ...	...	...	...	...	...	...	...	...	8	...	...	...	...	11	...	...	...	...	...	...	...
Gresley wheat ...	...	...	...	7½	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
College Algerian oats	...	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Algerian oats ...	...	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

YIELDS in the Lower North Coast Winter Fodder Fertiliser Trials.

	Superphosphate, ¾ cwt.	Superphosphate, ½ cwt.; sulphate of ammonia, ½ cwt.	Superphosphate, 1 cwt.; sulphate of ammonia, ½ cwt.	Superphosphate, 1½ cwt.; sulphate of ammonia, ¾ cwt.	Superphosphate, 1½ cwt.; sulphate of ammonia, ½ cwt.	Superphosphate, 1½ cwt.	No manure.
	tons.	tons.	tons.	tons.	tons.	tons.	tons.
James Eakin, Belmore River ...	15½	16¼	16¾	...	...	...	14½
T. J. Warren, Lansdowne	...	...	...	12	10	8	6

Upper North Coast.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

Unfavourable weather conditions are invariably experienced on the Upper North Coast during late winter and spring. The wisdom of planting an area of winter cereals to provide feed for this period was again clearly demonstrated on plots conducted by the Department in co-operation with farmers.

The Season.

During the early months of the present year very wet conditions were experienced, with the result that thorough cultivation in the preparation of the seed-bed for these trials was impossible at some centres. The continuous rains, however, ceased towards the end of the autumn and the winter gradually became dry, the early spring being very dry. The plots generally made good growth, and the fodder produced was greatly appreciated as the dry conditions set in.

The rainfall during the growing period was as follows:—

RAINFALL Table.

	Murwillumbah.	Mullumbimby.	Coramba. (Glenreagh).	Bellingen. (Raleigh).
	Points.	Points.	Points.	Points.
May	......	390	25	498
June	16	141	250	83
July	144	172	270	223
August	338	269	36	48
September	197	78	50	22
October (1st to 20th)...	68	......	......	......
Total ...	673	1,050	631	874

YIELDS of Upper North Coast Winter Fodders.

	Murwillumbah.		Mullumbimby.		Glenreagh.		Coramba.		Raleigh.	
	Date Harvested	Yield per acre.	Date Harvested.	Yield per acre.	Date Harvested.	Yield per acre.	Date Harvested.	Yield per acre.	Date Harvested.	Yield per acre.
	1931.	t. c. q.	1931.	t. c. q.	1931.	t. c. q.	1931.	t. c. q.	1931.	t. c. q.
Wheat Variety Trial.										
Clarendon	3 Sept.	8 15 3	4 Sept.	3 4 1	14 Aug.	11 14 1	20 Aug.	6 7 3	24 Sept.	3 17 1
Gresley	29 ,,	8 1 2	4 ,,	1 11 2	9 Sept.	6 11 2	18 Sept.	5 2 3	24 ,,	4 5 3
Oat Variety Trial.										
Sunrise	29 Sept.	13 3 2	4 Sept.	4 0 0	9 Sept.	10 12 3	18 Sept.	9 4 1	24 Sept.	5 10 0
Buddah	29 ,,	11 12 3	4 ,,	3 14 1	9 ,,	10 15 3	18 ,,	8 8 2	24 ,,	4 11 2
Algerian	20 Oct.	8 17 1	...	...	9 Oct.	6 15 3	9 Oct.	5 12 3	15 Oct.	8 16 2
College Algerian	20 ,,	8 8 1	...	...	9 ,,	5 18 2	9 ,,	6 17 1	15 ,,	9 11 2
Cereal and Legume Combination Trial.										
1 part Gresley wheat, 1 part Buddah oats, Woolly-podded vetch, Lima field peas	29 Sept.	11 18 2	4 Sept.	3 14 1	9 Sept.	12 0 0	18 Sept.	5 19 2	24 Sept.	5 18 2
1 part Gresley wheat, 3 parts Buddah oats, Woolly-podded vetch, Lima field peas	29 ,,	11 12 3	4 ,,	4 11 2	9 ,,	10 11 2	18 ,,	6 7 1	24 ,,	5 14 2
1 part Gresley wheat, 3 parts Sunrise oats, Woolly-podded vetch, Lima field peas	29 ,,	11 2 3	4 ,,	3 15 3	9 ,,	11 8 2	18 ,,	6 11 2	24 ,,	4 14 1
Rye Variety Trial.										
Black Winter	3 Sept.	9 11 2	4 Sept.	2 11 2	22 Aug.	10 17 1	20 Aug.	10 19 1	24 Sept.	5 14 1
Slav	3 ,,	8 8 1	4 ,,	3 2 3	22 ,,	11 3 2	20 ,,	11 10 0	24 ,,	5 1 2
Manurial Trial (Clarendon Wheat).										
2 cwt. superphosphate per acre	3 Sept.	8 5 3	4 Sept.	3 4 1	14 Aug.	11 14 1	20 Aug.	6 17 3	24 Sept.	3 17 1
No manure	3 ,,	6 8 2	4 ..	2 11 2	22 ,,	1 18 2	20 ,,	5 16 2	24 ,,	3 11 2

Wheat Variety Trials.

Clarendon wheat has continued to maintain its reputation in this district as a yielder of early green fodder. It is a variety that is very rapid growing and produces large quantities of green fodder in the late winter and early spring. Being erect in habit of growth it is easy to handle when chaffed up with other fodders. Gresley also did well, although it has done better in seasons of greater rainfall; it seems to be able to withstand the wet conditions better than other varieties. In maturity Gresley is later than Clarendon. Superphosphate was applied at the rate of 2 cwt. per acre to all plots in this trial.

Oat Variety Trials.

Judging by the growth made by Sunrise the weather conditions this year particularly suited that variety, which, as well as making wonderful growth, was very free from rust and outyielded Buddah at all centres, except Glenreagh. Buddah also did well; it is slightly earlier than Sunrise, not as tall in habit of growth, stools more freely, and is finer in the straw.

The two late-maturing varieties Algerian and College Algerian also did well, although the extremely dry conditions in the spring were responsible for the light yields. Of the two varieties College Algerian is slightly later maturing, possesses, if anything, a broader flag, which is more drooping, stools a little more freely, and is also finer in the straw. It does not, however, appear to be quite so hardy as Algerian.

Algerian is the variety which is generally used for grazing, for which purpose it is admirably suited. Being late maturing it lasts longer than the early varieties and is capable of making satisfactory growth even though grazed well into the spring. Experience has shown, however, that as the season advances it is better to cease grazing and cut the crop as required for fodder. The dry spring of 1931 clearly demonstrated the value of this variety.

Superphosphate was applied to this trial at the rate of 2 cwt. per acre.

Cereal and Legume Combination Trials.

This season Gresley wheat and Buddah oats in equal parts gave the most satisfactory results as the legumes grew more evenly through the plots. Gresley and Buddah are very satisfactory for growing in combination as they keep pace with each other throughout the growing period and head at the same time. The legumes Woolly-podded vetch and Lima field pea are both quick-growing varieties and are not smothered by the rapid growth of the cereals.

Superphosphate was applied to these trials at the rate of 2 cwt. per acre.

Rye Variety Trials.

Slav rye was found to be much slower growing than Black Winter, particularly during the early stages of growth, and although it has outyielded

Black Winter when harvested at the heading stage it is not recommended in preference to it, since rye is grown in this district for early grazing.

Superphosphate was applied to these trials at the rate of 2 cwt. per acre, and it was noted that the resultant growth possessed a broader flag, as well as being much more succulent in the early stages of growth.

The Manurial Trials (Clarendon Wheat).

The manured plots, as well as showing increases in yield, were earlier maturing than the unmanured plots; at Glenreagh the manured plot came into head over a fortnight earlier than the unmanured plot with a greatly increased yield.

The Far South Coast.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

Trials with varieties of winter-growing cereals for grazing and later cutting for hay were conducted on the farms of Messrs. N. S. Bate, Bodalla; A. J. Pheeney, South Wolumla; and C. Parberry and Sons, Bega. Owing to transfer of ownership of this last-mentioned property and to the fact that with the dry spring little growth was made by the crop, the trial was eaten off late in the spring and did not make sufficient growth after grazing to warrant harvesting.

The Season.

An excellent autumn followed by an average winter and a dry spring sums up the seasonal conditions. Given a moist spring some very excellent yields of hay would have been obtained, but unfortunately after the crops had been grazed off there was not sufficient rain to produce even average yields. It must be recognised, however, that oats are sown in this district primarily for grazing, the hay crop being a secondary though important consideration, and for this reason observational results are as important as the actual yields obtained from any variety. Accordingly the varieties were grazed hard in the spring and their recovery noted.

The rainfall at the two centres where yields were recorded was as follows:—

RAINFALL.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Total.
Bodalla ...	230	296	312	93	508	117	170	13	162	1,901
Wolumla ..	180	131	312	273	414	92	68	49	33	1,552

YIELDS in the Far South Coast Winter Fodder Variety Trials.

Crop and Variety.	Bodalla.				South Wolumla.			
	tons.	cwt.	q.	lb.	tons.	cwt.	q.	lb.
Wheat—								
* Gresley	5	1	0	0	......			
Clarendon	4	18	0	0	......			
Marshall's No. 3	6	11	0	0	......			
Barley—								
Skinless	4	15	0	0	......			
Oats—								
College Algerian	9	9	0	0	3	1	0	0
Algerian	8	12	0	0	......			
Guyra	8	14	0	0	3	2	0	0
Gidgee	9	13	0	0	2	10	0	0
Mulga	9	5	0	0	2	16	0	0

YIELDS in Manurial Trials (Algerian Oats).

Fertiliser per Acre.	Bodalla.				South Wolumla.			
	tons.	cwt.	q.	lb.	tons.	cwt.	q.	lb.
2 cwt. superphosphate	13	7	0	0	5	12	0	0
1 cwt. superphosphate	10	12	0	0	5	7	0	0
No manure	8	8	0	0	4	11	0	0

Comment.

The trial at Bodalla was grazed by dairy cattle, but the one at South Wolumla, owing to the late planting, was not. In this latter trial Skinless barley was eaten out by hares and the wheat plots were so thinned out that they were not harvested.

It was noticed that the cows preferred the wheat, especially the later-maturing variety Marshall's No. 3, to the oats, but the wheat did not come again at all well and failed to make satisfactory growth for hay.

Of the varieties of oats, College Algerian was the variety most favoured by the cows at Bodalla; in fact, it was eaten down like a pasture, whilst some of the early varieties, as Gidgee and Mulga, were left rather long and stalky. This is only to be expected with College Algerian, as it is such a fine-growing oat and in the early stages stools very heavily and forms flaggy tussocks, which are much favoured by stock. Compared with Algerian it showed up better this season than last. Of the early varieties, Gidgee would appear to be the best, as it has done consistently well in trials over the past few seasons. It stands grazing well, yields well, but has one serious fault in that it is a very rust-liable variety; this weakness was not in evidence this season as there was very little rust in any of the oat crops in the district.

In the manurial trials the value of superphosphate was amply demonstrated. Increases in yields of nearly all crops are possible in this district by the use of superphosphate and the practice of using fertiliser is fairly general.

The South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

The crops sown in the winter green fodder experiments on the South Coast during the past winter met good weather conditions at planting time, and good rains were experienced throughout the winter. The heavy frosts in many parts and a great amount of west wind during the early spring were factors which perhaps influenced the unusually late maturity of the crops. As a rule, March-sown crops, and especially the earlier-maturing varieties, make rapid growth, so much so that Florence and Firbank wheat and Buddah oats are generally well out in ear in July, but this season such crops, sown at the time mentioned, were not in ear until well into August.

Florence and Firbank wheats upheld their record for quick maturity, and Gresley, later in maturity, showed to advantage as a good yielder. Of the oat varieties Buddah is easily the most attractive green fodder variety, maturing when green feed is scarce, yielding well and proving very palatable to the stock.

There was evidence of rust in Mulga in some districts. This is the usual experience with this variety when wet winters occur. Sunrise oats was satisfactory and also Algerian, although this late-maturing oat was not of much avail this season as there was plenty of grass in most places when it matured. College Algerian again showed earlier maturity than the old type.

The addition of vetches to wheat and oat crops is an advantage in that the bulk is increased and the feeding value enhanced. Where the seed is broadcasted an addition of 20 to 30 lb. of vetch seed will prove satisfactory. In some cases disappointment may be met the first sowing. This is due, as a rule, to the fact that the necessary nitrifying organisms are not at first as abundant as required. Probably if the same area is again sown the following year the trouble will be overcome.

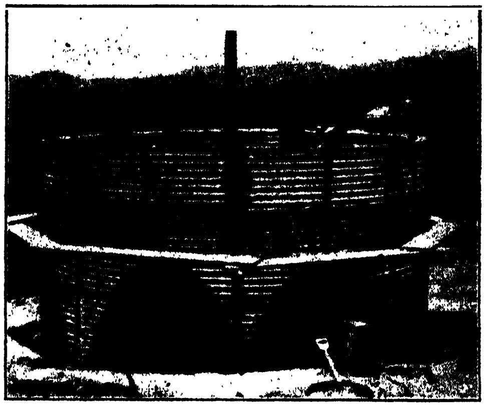
YIELDS of South Coast Winter Fodders.

	Kangaroo Valley, (A. Chittick.)				Pyree, (C. Watson.)				Camden, (J. Childs.)				Penrith. (W. J. Stanton.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Florence wheat	6	5	0	0	8	5	0	0	10	17	0	0	7	2	0	0
Firbank wheat	6	15	0	0	7	13	0	0	11	8	0	0	6	16	0	0
Gresley wheat	11	17	0	0	8	5	0	0	10	5	0	0	7	2	0	0
Gresley wheat and vetches	10	9	0	0	10	9	0	0	12	0	0	0	8	18	0	0
Buddah oats	14	9	0	0	16	2	0	0	13	19	0	0	9	11	0	0
Mulga oats	13	0	0	0	13	19	0	0	12	0	0	0	8	5	0	0
Sunrise oats	14	13	0	0	12	10	0	0	14	11	0	0	6	1	0	0
Sunrise oats and vetches...	13	9	0	0	14	8	0	0	15	8	0	0	7	5	0	0
College Algerian oats ...	15	17	0	0	......				15	8	0	0	6	7	0	0
Algerian oats	14	18	0	0	12	17	0	0	16	0	0	0	6	13	0	0
Rainfall	29 in.				Not available.				Not available.				25·39 in.			
Date sown	27/3/31.				26/3/31.				1/6/31.				7/5/31.			
Date harvested	10/8–12/10/31				2/9–28/10/31.				19/10/31.				20/9–2/11/31			

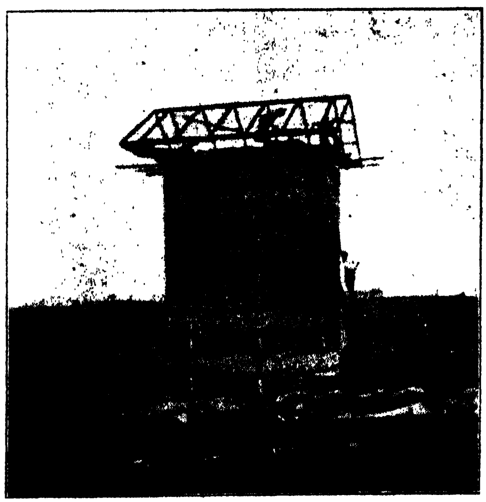
This 85-ton Overhead Silo Cost Only £100.

THE achievement of Mr. Alex Smith, of Bandon Grove, in erecting an overhead concrete silo of 85 tons capacity for £100 should silence those dairy farmers whose only argument against the silo is what they term "its prohibitive cost."

Mr. Smith has shown how the cost can be kept down when the farmer is prepared to put his own labour and perhaps that of his grown-up sons into the job. Neither Mr. Smith nor his sons, who assisted in the erection of the silo, had any experience in building construction. A carpenter was employed for two weeks to put on the roof and construct the elevator and chute, but even that side of the work might not prove beyond many a handy farmer, particularly as assistance and advice on all these matters is available from the Department of Agriculture. As a matter of fact, the silo at Bandon Grove was built with the aid of moulds loaned by the Department. Mr. N. L. Jones, Supervising Architect of the Department, found the finished job to be perfectly plumb and built to a true circle. It holds sufficient conserved fodder to feed thirty cows for five months.



The Corrugated Iron Moulds in Position.



The Silo Nearing Completion.

That dairy farmers are beginning to realise the economic importance—it amounts to a necessity in many instances—of the silo is evidenced by the number that has been erected during the past six months.

Clarence River Cane Competitions, 1931.

EXTRACTS FROM THE JUDGE'S REPORTS.

L. S. HARRISON, H.D.A., Special Agricultural Instructor.

THE sugarcane competitions completed this year on the Clarence River were in three sections, viz., two-year cane, for which there were twenty entries in 2-acre blocks, one-year cane for which there were twelve entries in blocks of 1 acre each, and one-year cane for limited areas on the Upper River for which there were five entries of ½ acre each. The small area contest was arranged because the one-year type was being tried out as to suitability for that part of the Clarence River.

As was the case last season, the number of entries is regarded as being particularly satisfactory and undoubtedly fully representative of the cane-growing areas of the Clarence River. Throughout the attention to the

A Competition Plot.

crops was of a high order, indicating that growers are mostly aware of the particular cultural needs of their soils.

The cultural details of the leading crops are given below.

THE TWO-YEAR COMPETITION.

Ross Anderson, Coolah Island (N.G. 16).—The land had been under cultivation approximately sixty years, and the previous crop was part maize and part maize and cowpeas, following cane. The first ploughing was

given in July, after which the land was harrowed, rolled, re-ploughed, harrowed, and rolled twice. Planting took place in the middle of October in rows 4 feet 8 inches apart, single sets being dropped on the run every 2 feet 3 inches After planting the plot was ploughed away and scuffled back, ploughed away and raked off, and then cultivated six times.

Estate of Mrs. Green, Palmer's Channel (Malabar).—This was old cultivation land, and the previous crop was maize following cane. First ploughing was given in June, and the plot was later re-ploughed and harrowed several times. Sets were dropped by machine at the end of September on the square, 4½ feet between. The land was then harrowed, ploughed away, and scuffled four times.

D. A. Cameron, Taloumbi (N.G. 16).—This land had been forty years under cultivation. The cane trash was ploughed in, then cowpeas were planted: after they were ploughed under in February field peas followed, which were ploughed under in August. Planting took place in early October by machine in plough drills with a double drop on the square 4½ feet apart. After planting the plot was ploughed away and harrowed, cultivated each way six times.

Comment.

It is the usual practice to control weeds in the later stages of the growth of cane crops with the hoe, and most of the crops referred to here were treated in that way.

Early ploughing is a noticeable feature of entries occupying high positions in the award table, and this practice is one of particular importance. These growers are aware of the great improvement in general soil condition when early ploughing has taken place; when maize stalks or a heavy cover of any description is ploughed under, it is of even greater importance, because time must be allowed for the complete breakdown of all such material. The addition of green leguminous crops, such as cowpeas, is most valuable, and many growers are fully aware of the advantages of this practice; in fact, nine competitors used this valuable crop prior to cane planting; cowpeas must, however, be ploughed under while green, otherwise much of their nitrogenous value is lost, for when the crop has been allowed to completely dry off the nitrogenous content is negligible.

Ploughing away was, in most cases done at an early stage of the crop's growth, and by the majority was done once only—this was so with eleven entries, whilst two did not carry out the practice at all. Certain field conditions, mainly those dictated by weather conditions at planting, cause some such process as ploughing away to become almost a necessity, and it is of much interest to note that thirteen competitors ploughed away no more than once.

In no case was artificial fertiliser used.

AWARDS in Clarence River Two-year Cane Competition, 1931.

Competitor.	Variety.	Cultivation. (Maximum 20 points.)	Evenness and Lack of Patchiness. (Maximum 20 points.)	Stooling. (Maximum 10 points.)	Freedom from Disease. (Maximum 15 points.)	Freedom from Lodging. (Maximum 7½ points.)	Points for commercial value of Crop.	Estimated Tonnage per acre.	P.O.C.S.*	Total.
Ross Anderson	N.G. 16 ...	18½	18	8½	15	4	25	60	13·1	89
Estate of Mrs. Green ...	Malabar ...	17	16	9	15	7½	24	50	14·4	88½
D. A. Cameron	N.G. 16 ...	18½	19	8½	15	7½	19	45	13·1	87½
C. H. Clark	Badilla ...	15	17	9	15	6	25	60	13·1	87
Alex Anderson	N.G. 16 ...	18½	16½	8½	15	5	22	55	12·9	85½
John Ryan	Malabar ...	18½	18	9	15	4	21	85	9·9	85½
G. R. Anderson	N.G. 16 ...	18	18	9½	15	7½	16	45	12·2	84
A. A. Cameron	N.G. 16 ...	17	17	8	15	6	18	45	13·0	81
C. Goddard	N.G. 16 ...	18	18	9	14	5½	16	60	10·4	80½
J. Bancroft	Badilla ...	15	18	8	14½	7½	17	30	16·1	80
Mrs. Albert	N.G. 125 } N.G. 16 }	17½	16	8	9	4	25	55	14·0	79½
H. Stewart	N.G. 16 ...	18	15	7	14	7½	17	35	14·5	78½
M. Stewart	N.G. 16 ...	18	15	8	15	5	17	55	11·0	78
F. Carr, junior	N.G. 16 ...	16	17½	8	15	7½	13	25	15·5	77
H. McLeod	N.G. 14 ...	17	18	8½	15	5	13	50	10·3	76½
C. A. Watson	N.G. 16 ...	18	15	7	12	7½	16	35	13·9	75½
A. O. Watson	N.G. 16 ...	17	16	8	12	5	14	55	9·9	72
J. J. Grey	N.G. 16 ...	14	14	7½	15	6	9	30	10·9	65½

* All the P.O.C.S. figures throughout the competition were determined by the small-mill test, except in the case of Mr. Campbell in the one year competition, when a small-mill sample was missed and the large-mill test had to be taken. In one or two cases samples diverge rather much from the large-mill test figures for two whole field, containing the competition block. This is unavoidable, but in future competitions it is hoped to use large-mill test figures only.

THE ONE-YEAR CANE COMPETITION.

The cultural details of the winning crops were as follows:—

A. O. Watson, Tyndale (Q. 813).—This land had been long under cultivation, but had been out for some years prior to one previous crop of cane. Maize was planted following that crop, after which field peas (which failed) were planted. Residues were ploughed under at the end of August, after which the land was re-ploughed, harrowed, and rolled three times. Sets were dropped by hand 3 feet 6 inches apart in mid-October, in a 7-inch furrow with a 4-inch hoe cover, in rows 4 feet apart. After planting the land was rolled, harrowed, ploughed away, raked off, ploughed to and scuffled three times.

K Ryan, South Arm (Q. 813).—Land approximately forty years under cultivation, the previous crop being maize. First ploughing took place in March, after which the land was harrowed, re-ploughed in June, harrowed, rolled and re-ploughed. Planting took place in early September in rows 4 feet 3 inches apart. Sets were double dropped by hand on the square in 10-inch plough drills, and were given a 6-inch hoe cover. After planting the land was ploughed away, scuffled four times, ploughed away again and scuffled three times.

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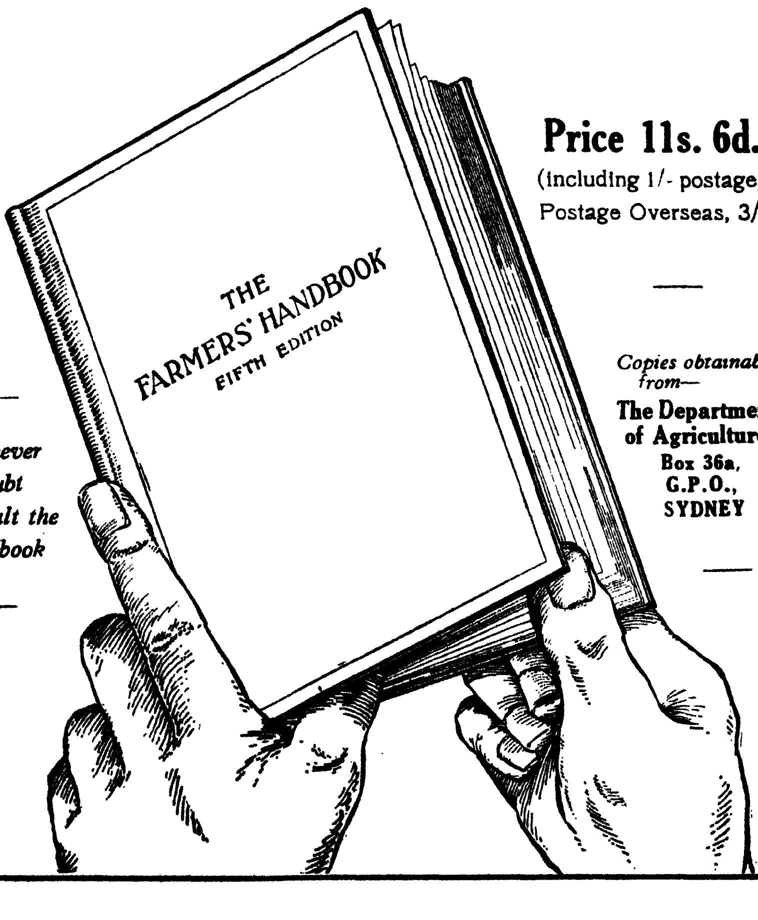

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A. Campbell, Chatsworth (Q. 813).—This land had been under cultivation for approximately sixty years, the previous crop being maize and cowpeas which practically failed. It was ploughed in July and was later harrowed, rolled, re-ploughed, harrowed and rolled, re-ploughed, harrowed, and rolled. Planting took place in mid-September with a machine, sets being dropped in 5-inch furrows, and were given a 5-inch cover, the rows being 4 feet 6 inches apart. Sets were dropped approximately 1 foot apart in the rows. A dressing of sulphate of ammonia at the rate of 3½ cwt. to the acre was given in January. The paddock was later ploughed away, raked off, and scuffled five times.

J. Garven, Palmer's Island (Q. 813).—Land had been under cultivation fifteen years, but had been out the previous two. French Beans were planted after the previous cane crop, the land then being dressed with 6 cwt. lime to the acre. Then a crop of garden peas was grown, the residue of which was ploughed under in March; the land was re-ploughed in August, harrowed and rolled. Planting took place in early September with a machine in drills 8 inches deep which were given a 2-inch cover. Rows were 4 feet 3 inches apart and sets were singly dropped every 2 feet. After planting the paddock was ploughed away, lightly raked off, and cultivated nine times.

Comment.

Careful cultural treatment and realisation of the value of leguminous crops are again evidenced in this series.

Of the ten entries only one was ploughed away more than once.

In one instance only was artificial fertiliser used, and this competitor received highest points (with one other competitor) for commercial value of crop.

ONE-YEAR CANE.—HALF-ACRE BLOCKS OF Q. 813 ON THE UPPER RIVER.

Details of the cultural methods of the leading entries in this competition follow:—

A. Cameron, Woodford Leigh.—This land had been sixteen years under cultivation, the previous crop being maize. First ploughing took place in August, after which it was harrowed and rolled, re-ploughed, harrowed, rolled, re-ploughed, harrowed and rolled. Planting took place in the middle of September, sets being double-dropped by hand in 10-inch plough drills, which were given a 6-inch cover. Planting was on the square, 4 feet between. After planting the plot was ploughed away, cultivated, middles ploughed, cultivated five times.

A. Want, Woodford Leigh.—The land had been sixty years under cultivation, but had not grown a crop of cane for approximately seven years. The paddock had grown cowpeas, oats, saccaline, and maize the previous year in different portions. First ploughing took place in September; the land was then harrowed, rolled, re-ploughed, harrowed, rolled, and re-ploughed. Planting took place in mid-October, sets being dropped by hand

2 feet 6 inches apart in rows 4 feet 6 inches apart. The drills were 10 inches deep and a 3-inch plough cover was made. After planting the plot was ploughed away, scuffled, twice plough hilled.

A. E. Collins, Lower Lawrence.—This land had been approximately forty years under cultivation, the previous crop being early maize followed by green peas, which failed. The paddock later produced a heavy weed growth which was ploughed under in April. It was later harrowed, rolled, re-ploughed, harrowed, re-ploughed, harrowed and rolled. Planting took place in mid-September in plough drills which were 4 feet 3 inches apart, single sets being dropped on the run, covered with a cultivator and the plot rolled. It was later harrowed three times, ploughed away, middled and scuffled four times.

AWARDS in the Clarence River One-year Cane Competitions, 1931.

Competitors.	Cultivation (Max. 20 points).	Evenness and Lack of Patchiness (Max. 20 points).	Stooling (Max. 10 points).	Freedom from Disease (Max. 15 points).	Freedom from Lodging (Max. 7½ points).	Points for Commercial value of Crop.	Estimated tonnage per acre.	P.O.C.S.	Total Points.
				1-Acre Blocks.					
A. O. Watson... ...	18	17½	9	15	3	17	40	13·4	79½
K. Ryan	18½	17	8	15	7½	13	25	15·0	79
A. Campbell	18½	17½	8	14½	2½	17	35	14·4	78
J. Garven	19	17	9	15	2	16	40	12·9	78
F. J. Bathgate ...	18	17½	8½	15	2½	16	35	13·9	77½
W. J. Ryan	18½	17	8½	15	7½	11	20	15·4	77½
D. Anderson	19	16½	7½	15	4	14	35	12·9	76
Mrs. Noonan	18½	15	8½	15	4	15	35	13·5	76
S. J. Bathgate ...	18	18	8½	15	2½	12	35	12·0	74
J. Hart	17½	14	8	15	4½	13	30	13·6	72
				½-Acre Blocks.					
A. E. Collins	18	19	9	15	1	17	40	13·4	79
A. Want	16½	14½	8	15	7½	11	25	13·9	72½
A. Cameron	16	16	9	15	2½	12	35	11·9	70½

LORD HOWE ISLAND ONION YIELDS WELL AT COWRA.

AN excellent yielder, but a poor keeper, about sums up the Lord Howe Island onion variety, if the results of the trials conducted last season at Cowra Experiment Farm by Mr. A. Pearson, Experimentalist, can be taken as a guide. With a yield of 18¾ tons per acre it easily outyielded the next highest yielder, Early Flat Cape, which produced 15 tons 6 cwt. per acre. The only other variety to yield over 15 tons was C. S. Redgrove's strain of Hunter River Brown Spanish, which, in the Cowra competition, was grown as the standard variety. Lord Howe Island yielded large flat onions with fine necks, but with very coarse-textured flesh, which went bad quickly.

Stem Nematode Disease of Lucerne.

WITH REVIEW OF LITERATURE CONCERNING THE CAUSAL ORGANISM *Tylenchus dipsaci* (KUHN) BAST.

E. T. EDWARDS, B.Sc.Agr., Assistant Biologist.*

THE stem and bulb nematode *Tylenchus dipsaci* has been known for many years as an important parasite of a great number of agricultural and horticultural plants. It is commonly found infesting cereals, bulbs, strawberries, lucerne and other leguminous fodder crops and many weeds and pasture plants. It is the object of the present article to deal specifically with a serious disease of lucerne which it causes in New South Wales, and at the same time to give an account of the present-day knowledge of the biology of the causal organism.

Early References, Distribution and Economic Importance.

The stem nematode is known to occur in the British Isles, Europe, United States of America, South Africa and Australia, and is apparently worldwide in its distribution. It is believed to have been present in Germany as early as 1819, in which year Schwerz[48] described a disease of red clover which was very similar to the condition now known to be caused by *Tylenchus dipsaci.* The first record of the occurrence of stem nematode on lucerne was made by Kuhn[30] in 1881, who described it as a new species, *Tylenchus Havensteinii.* Later work by Ritzema Bos[40] showed that this form from lucerne was identical with *Tylenchus dipsaci.* It was recorded from a number of hosts by various continental workers during the latter half of last century. Ritzema Bos[40] in 1888 stated that it was known as a parasite of thirty-four species representing fourteen natural orders of plants. It was known to have been present in England in 1887, when Ritzema Bos[40] identified it from diseased clover obtained from Miss Ormerod, consulting entomologist to the Royal Agricultural Society of England. Lounsbury[32] reported it as a serious pest of lucerne in South Africa in 1909, and stated that it had probably been present for some years before being recognised. Byars[4] in 1920 recorded *Tylenchus dipsaci* as a serious pest of red clover and strawberries in the Pacific north-western states of America, and stated that it was known to occur in Kansas in 1907, where it was found causing a stem disease of rye. McKay[34] in 1922 reported it from lucerne in Oregon and stated that it had not previously been recorded on this host in America. Godfrey[13] in the same year reported that during the previous season it occurred in America on red clover, alfalfa, strawberries, and daffodils, and was causing serious damage to the first three hosts in Oregon and Idaho. It is now widespread throughout the United States, Cobb[6] in 1928-29 reporting that it was known to occur in twenty-six States.

*The writer is indebted to Mr. P. R. Maguire for the photographic work.

It was first recorded in Australia from the Drysdale district in Victoria, where in 1891 Pearson found onions heavily attacked by a nematode which he failed to identify. Specimens of the diseased material were later forwarded to Cobb[5], who identified the organism as *Tylenchus devastatrix*, which is synonymous with *T. dipsaci*. Kirk[28] incorrectly reported this nematode from potato tubers in New Zealand in 1907, and it was again incorrectly recorded on the same host by Harvey Johnston[23] in New South Wales in 1909. Both these reports contain a description of the symptoms produced together with photographs of the diseased tubers, and it is obvious that the injury in both cases is the result of infestation with *Caconema radicicola*, and not with *Tylenchus dipsaci*.

Noble[35] in 1925 called attention to the presence of the disease on lucerne in the Hunter River district of New South Wales, and stated that growers were of the opinion that it had been present in their fields for many years. The stem nematode is now known to be widespread throughout the lucerne-growing areas of New South Wales, and, in addition to the Hunter River districts, has been recorded from Bathurst, Cowra, Parkes, Grafton, Glen Innes, Bega, Nowra, Cassilis, Richmond, and Windsor.

On a recent visit to the Hunter River area the stem nematode disease was found to be particularly severe on the river flats in the vicinity of Maitland. In many cases the lucerne fields had been quickly reduced to an unprofitable thinness, and replanting with other crops was frequently found to be necessary within three to four years. In one instance a stand only two years old had practically been killed outright. A few dwarfed and stunted lucerne plants remained, but the area was mainly overgrown with weeds and grasses. The seriousness of the disease may be judged from the fact that under normal conditions in the most favourable lucerne-growing areas of the State the crop frequently remains profitable for upwards of twenty to thirty years.

Host Plants.

The stem nematode has a very wide host range. Goodey[20] in 1929 lists it as occurring on 126 plant species representing thirty natural orders, the principal ones being gramineae, leguminoseae, compositae, cruciferae, polygonaceae, liliaceae, and amaryllidaceae. In 1931 the same worker [22] reported that the host range was then known to include 135 species of wild and cultivated plants.

The host plants thus far recorded in New South Wales are narcissus, daffodil, lucerne, two species of medics, *Medicago denticulata* and *Medicago minima*, and prairie grass (*Bromus unioloides*). The three latter hosts were recorded by the writer at Bathurst Experiment Farm in September, 1931. In each case the host plants were present as weeds in plots of lucerne which were heavily infested with *Tylenchus dipsaci*.

Specimens of the affected prairie grass were forwarded to Dr. Steiner, Senior Nematologist, of the Bureau of Plant Industry, U.S.A., who confirmed the finding of *Tylenchus dipsaci*, and stated that apparently the

several new genera and grouped *Anguillula dipsaci* Kuhn along with several other forms into the new genus Tylenchus; so that the organism thus became *Tylenchus dipsaci* (Kuhn) Bast.

In 1880 Havenstein forwarded to Kuhn specimens of lucerne and red clover infested with nematodes which the latter (30) in the following year described as a new species and named *Tylenchus Havensteinii.* In 1881 Prillieux (36) working on a nematode disease of hyacinths in France named the causal organism *Tylenchus hyacinthi.* Two years later, Beyerinck (3) working on a somewhat similar disease of onions in southern Holland named the causal organism *Tylenchus allii.*

Between 1882 and 1888 Ritzema Bos (40) devoted considerable attention to the systematic study of these parasitic nematodes, and after a series of careful observations and measurements he concluded that *Tylenchus dipsaci* (Kuhn) Bast., *Tylenchus devastratrix* (Kuhn), *Tylenchus hyacinthi* (Prillieux), *Tylenchus Havensteinii* (Kuhn), and *Tylenchus allii* (Beyerinck), were one and the same species, which he continued to call *Tylenchus devastatrix,* as he considered this specific name preferable to the original.

Baylis and Daubney (2) have revived the old generic name of Anguillulina (Gervais and Van Beneden), 1859, for those nemas which since 1865 have been classified under the name of *Tylenchus* (Bast.). Goodey (19) has recently pointed out that according to the Law of Priority of the international Rules of Zoological Nomenclature, the earlier name of Anguillulina must have precedence over the later name of Tylenchus; so that strictly speaking the correct name for the stem nematode is *Anguillulina dipsaci* (Kuhn, 1857). However, Goodey (19) further states that owing to the generic name of Tylenchus being so widely used in scientific literature, a petition is being presented to the International Committee on Zoological Nomenclature for the retention of the name Tylenchus. As no finality has thus far been reached it seems preferable for the time being at least to adhere to the name *Tylenchus dipsaci* (Kuhn) Bast., which is the name most commonly used in reference to the organism.

Description of *Tylenchus dipsaci.*

Tylenchus dipsaci is a small, slender, unsegmented, elongated, cylindric organism, ranging in length from 1 to 1¾ millimetres, and typically only about one-fortieth as wide as long. The cuticle is colourless and glabrous, and the organism normally appears smooth and glistening, but upon close examination is found to be marked by a series of very fine transverse striae. The normal body movements are due to the alternate action of dorsal and ventral muscles, and as the cuticle is non-compressible along the lateral lines the nema must always move in the dorso-ventral plane.

The body tapers gradually towards the extremities, the tapering being more pronounced posteriorly, particularly in the males, where it is sharply accentuated beyond the cloaca. The anterior end is truncate. The lips are rudimentary, and the head region bears four minute papillae, together with the amphids or lateral organs, which are thought to be

chemical sense organs by means of which the nema locates its preferred host plant. The buccal cavity contains the spear or stylet, which is a very small slender organ, characteristically three-lobed at the base, and which is moved rapidly backwards and forwards by antagonistic sets of muscles.

The alimentary tract is simple. The oesophagus is a comparatively straight narrow tube about one-sixth the length of the body, and contains two oesophageal bulbs. The first bulb occurs about midway down the oesophagus as a well defined oval swelling with thick muscular walls. It

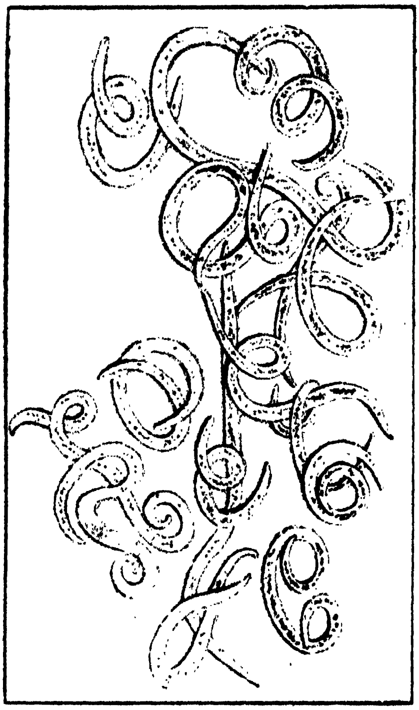


Fig. 3.—Group of Stem Nematodes, *Tylenchus dipsaci*.
Showing the general form and shape.

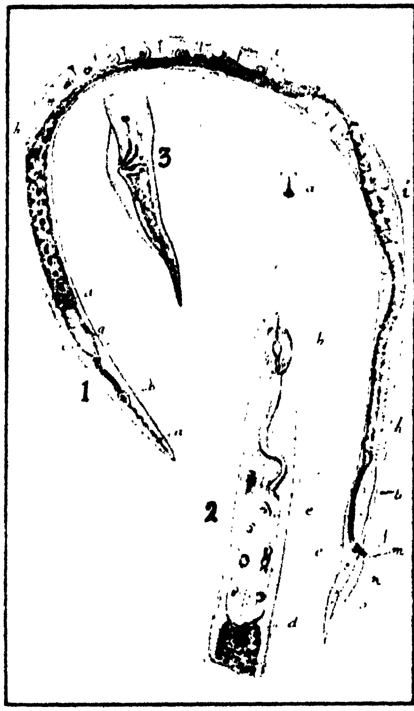


Fig. 4.—*Tylenchus dipsaci*.
1. Male nematode.
2. Enlarged view of anterior end. *a*. Stylet or buccal spear. *b*. First or muscular oesophageal bulb. *c*. Second oesophageal bulb. *d*. Intestine. *e-f*. Rectum. *f*. Cloaca. *g*. Excretory pore. *h*. Anterior end of testis. *i-k*. Spermatoblasts or sperm mother cells. *l*. Vas deferens. *m*. Spicula. *n*. Accessary pieces. *o*. Bursa.
3. Posterior region of male, showing the bursa and spicula.
[*After Ritzema Bos.*

functions as a sucking organ to facilitate the ingestion of food. The second bulb is situated just before the junction of the oesophagus and the intestine. It is more elongated and not so clearly defined as the first bulb, and muscular walls are absent. The intestine is a comparatively large organ, and occupies the greater part of the body cavity. It empties ventrally through the anus, which is situated at some little distance from the caudal extremity.

There is no organised respiratory or vascular circulatory system. The nervous system essentially consists of a circumoesophageal nerve ring with lateral ganglia. The excretory system consists of the ventral gland, which lies just behind the oesophagus and empties by means of a fine duct through the ventral excretory pore, which is situated midway between the nerve ring and the posterior end of the oesophagus.

The sexes are distinct, the males normally being slightly smaller than the females. The female genital organs essentially consist of a simple tube differentiated into ovary, oviduct, uterus, and vagina, which opens externally through the vulva. In addition, a rudimentary and functionless sac-like posterior branch of the sexual tube extends backwards from the vulva. The vulva is situated ventrally, and is quite distinct from the anus. In the males, however, the reproductive organs and the intestine both empty through a common orifice known as the cloaca.

The male genital organs likewise consist of a single tube, which expands forward to near the oesophagus and is differentiated into testis, vas deferens, and ejaculatory duct. The copulatory organs or spicula are two in number, and consist of curved pieces of hardened cuticula about one-tenth of a millimetre in length. They slide forward in grooved pieces of cuticula known as the accessory pieces, which are generally about half as long as the spicula. In addition, the males possess a definite clasping organ known as the bursa. It consists of a thin transparent ribless flap-like expansion of the cuticula, which originates near the spicula and extends backwards almost to the posterior extremity of the body.

Development and Life History of *Tylenchus dipsaci*.

The eggs in various stages of segmentation are deposited singly, although several hundred may be laid by the one individual. They vary a good deal in shape and size, but are essentially elongate, more or less cylindric with rounded ends, and average about 70 to 90 microns in length by 20 to 30 microns in width. After deposition the development of the embryo proceeds fairly rapidly, and the young nema can be readily seen coiled up within the egg. Prior to hatching the young larva becomes active and moves round within the egg membrane with a sliding serpentine-like motion. Finally the anterior end is forced through the enveloping membrane and the young larva emerges. In general shape and appearance the young larva is similar to the adult nema, although it is considerably smaller, only being about one-tenth as long, but no sexual differentiation is apparent. As the larva increases in size it normally moults or sheds its skin about four times before reaching the adult stage.

Robertson[41], working with *Tylenchus dipsaci* on oats, states that the eggs have an incubation period of five to seven days, and that the young larvae become sexually mature adults in twenty-two to twenty-eight days. Goodey[37] in 1922 found that by inoculating clover seedlings with single eggs containing well-developed larvae mature and sexually differentiated

nemas were present in twenty-four to thirty days from the date of inoculation. Observations made by Fox-Wilson[10] in 1924, on the breeding habits of *Tylenchus dipsaci* infesting phloxes indicate that reproduction mainly takes place during the warmer months. He found that egg deposition began soon after spring growth commenced and continued throughout the summer, the nemas reaching their maximum numbers about midsummer. Hodson[24], 1926, states that normally reproduction only takes place either in rapidly growing succulent tissues or in storage tissues, and that temperature seems to affect the nemas only indirectly in so far as it controls

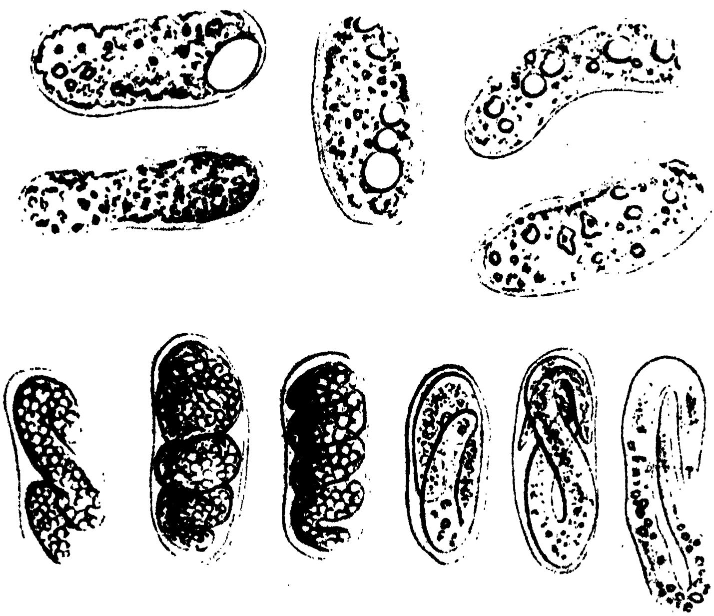


Fig. 5.—Eggs of *Tylenchus dipsaci.*

Showing the general morphological characters and the final stages of development, together with a recently emerged larval nematode.

[*After Ritzema Bos.*

plant growth. Under New South Wales conditions all stages of the nematode have been found to occur in diseased lucerne stems throughout the year, but the eggs and larval stages are more abundant in the spring and summer months.

Various workers have observed that as the plants approach maturity or die away as a result of infestation the nemas tend to leave the tissues and migrate into the soil in search of fresh host plants. Fox-Wilson[10] found this to be the case with the strain infesting phlox, and Robertson[41] made the same type of observation with *Tylenchus dipsaci* on oats. The latter[41]

examined a series of soil samples taken from a heavily infested oat field, and found that enormous numbers of *Tylenchus dipsaci* were present in the soil during the autumn and winter months.

Longevity of *Tylenchus dipsaci.*

The length of life of the stem nematode seems to depend very largely on environmental conditions. Hodson[24], 1926, has shown that in the presence of moist decaying tissues the organism dies within a very short period. The same worker, however, has kept adults alive in distilled water for periods up to five weeks, death apparently being due to starvation.

The nemas which leave the host tissues and migrate into the soil are unable to become quiescent whilst they remain in a moist environment, and, moreover, they are unable to feed until a suitable host plant is located. The length of time during which this enforced starvation can be withstood is not known, but Hodson[24], 1926, states that preliminary experiments indicate that it is probably much shorter than has generally been supposed.

However, in the absence of a moist environment, *Tylenchus dipsaci,* in common with many other nematodes, is able to become quiescent and remain in this dormant condition for long periods. Goodey[18] in 1923 showed that the pre-adult or last larval stage of *Tylenchus dipsaci* was the form which appeared to resist desiccation for the longest periods. He found that quiescent nemas from diseased onions and narcissus bulbs were readily revived in water after periods of desiccation ranging from two to two and a quarter years. More recently it has been shown by the same worker[21] in 1930, that the larvae of *Tylenchus dipsaci* are capable of active revival in water, after having been maintained in the dry condition for a period of a little more than six years.

Stem nematodes obtained from diseased lucerne collected at Windsor, New South Wales, in November, 1929, were successfully revived by the writer in February, 1932, after a desiccation period of practically two and a quarter years. Only one lot of older material was available, and this had been collected in October, 1925, and stored in herbarium boxes along with naphthalene. Desiccated nemas were found to be plentiful in this material, but repeated efforts to revive them failed. Nemas which had been stored for periods of up to twelve months were readily revived and became active within a few minutes.

It is a matter of common observation that quiescent nemas appear to be well supplied with an abundance of reserve food material. Goodey[22], 1930, has recently shown that these food reserves are composed of fats in the form of small spherical droplets of non-drying oil. In *Tylenchus dipsaci* they occur within the intestinal cells, in the body cavity round the oesophagus, and in the tail region.

Effect of Temperature.

Ramsbottom[35], 1918, has shown that *Tylenchus dipsaci* is readily killed by direct heat. He found that at temperatures of 110 to 111 deg. Fahr. the nemas were killed in forty-five minutes, at 119 to 120 deg. Fahr. they survived fifteen minutes, at 128 to 132 deg. Fahr. they remained alive for nine minutes, and at 135 to 136 deg. Fahr. they were killed within five minutes. On the other hand, the organism was found to be very resistant to low temperatures. Infested bulbs left outside during the winter and subjected to 37 degrees of frost were found to contain live nematodes when examined. Likewise bulbs which had been planted and subjected to alternate freezing and thawing were again found to contain living nemas.

(*To be continued.*)

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6.200
Swane Bros....	1,000	1,000	250	500	500	3.250
Geo. McKee	1,000	2.000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1.000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

C. G. Savage, Director of Fruit Culture.

"Your *Farmers' Handbook* recently received, and I must say my only regret is that I did not purchase this most useful volume before," writes a Bingara farmer.

Some Points in Cherry Culture.

RECENT EXPERIENCES IN THE YOUNG DISTRICT.

S. A. THORNELL, Fruit Inspector.

DURING recent years, as the result of circumstances (including drought conditions), many changes have occurred in the methods of growing cherries at Young, and careful selection of stocks and varieties and of suitable sites for the location of the trees now receive more attention than formerly.

The Drought Resistance of Stocks.

During the droughts of 1929 and 1930 many cherry trees died in the Young district, and hundreds were left in a sickly or partly dead condition. Most of these were on Mazzard stock of poor quality, and a number were on a poor type of Kentish stock. There are several types of Mazzard stock in this district which are evidently not suitable for dry conditions, especially a Japanese type, and also a type of Kentish which is certainly not suitable. The small-leaf black-fruiting type of Mazzard does well at Young, likewise the true type Kentish and Mahaleb. Suitable varieties worked on these and planted in suitable situations with due regard to interpollination will usually give satisfaction.

Four of the chief varieties to suffer during the drought were Eagle's Seedling, Early Rivers, Early Purple Guigne, and Napoleon Bigarreau; St Margaret, Florence, and Lyons stood up very well. The latest plantings are mostly of good-carrying varieties, such as Florence, St. Margaret, and Noble, and a quantity of Napoleon for canning and crystallising purposes.

The stocks indicated are being used for the following varieties:—

Variety.	*Stock.*
Early Purple Guigne	Kentish or Mahaleb; the latter is preferred, but in either case root grafted or at any rate worked as close as possible to the root of the stock.
Early Lyons	Mazzard or Kentish.
Florence	Kentish.
St. Margaret	Kentish.
Noble	Kentish.
Eagle's Seedling	Mazzard.
Burgdorff's Seedling	Mazzard.
Napoleon Bigarreau	Mazzard.

The Mahaleb stock appears to have a tendency—similar to Kentish stock—to bring the trees into heavy and early fruiting. Though this stock has not proved generally satisfactory and has apparently produced a short-lived tree in many places ,it has proved suitable for Early Purple Guigne and Early Lyons in the Young district—especially the former variety, provided

the trees are root grafted or worked very close to the roots—and it is possible that Mahaleb may also be useful to bring other shy croppers more quickly into regular cropping, provided the above method of working is adopted. Selected Mahaleb roots from proved good trees are being included in a cherry stock trial to be conducted by the Fruit Branch of the Department.

Kentish stock proved its value as a drought-resister at Young during the past two years, and some original trees, now over forty years old, are still bearing good fruit. Kentish stock, like the Mahaleb, causes the trees to come into early bearing, and free development of fruit buds is noticeable in the fourth and fifth years. It may, therefore, cause such varieties as Napoleon Bigarreau, Eagle's Seedling, Werder's Early Black, Bedford Prolific, and Early Rivers to overcrop, unless planted on very rich soil and special attention given to pruning and cultural work. Mazzard stock is usually used when the five above-mentioned varieties are planted.

Suitable Varieties for Inter-pollination.

Block planting is now out of favour, especially with such varieties as Lyons, St. Margaret and Noble, as the returns from such plantings are usually not too satisfactory. For inter-pollination, Early Purple Guigne is usually planted with Lyons, and Californian Advance with Burgdorff's Seedling; Napoleon Bigarreau, Florence, St. Margaret, and Noble should be interplanted. Late Mottled Bigarreau has proved to be an excellent "polliniser" (variety for supplying suitable pollen) at Young for Noble or St. Margaret, but, unfortunately, this variety is of little commercial value, being easily bruised and a poor carrier. If a grower decided to use it he should reduce the number to the minimum, which can be done by following the manner of placing shown in Fig. 1, which allows one polliniser to eight trees, all in direct contact. If Napoleon Bigarreau, which is of some commercial value, is to be used to pollinate Florence, St. Margaret, or Noble, then every third row could be Napoleon, as in Fig. 2.

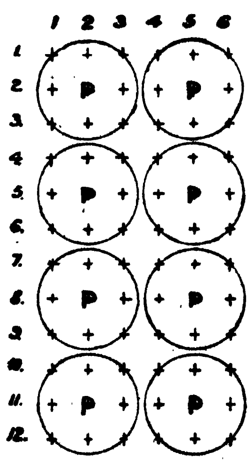


Fig. 1.—A Method of Planting designed to use a minimum of "pollenisers."

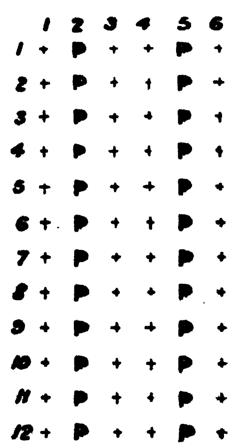


Fig. 2.—A System of Planting used where a commercial variety is available suitable for cross-pollination.

St. Margaret and Noble on Kentish stock, and pollenised as suggested, should show a profitable return in eight years and give some return before that. Florence on Kentish, and suitably pollenised, is a heavy and consistent cropper, and at Young will yield well from six years of age onwards.

Soil and Cultivation Methods.

In the past soil and situation did not receive sufficient consideration before the trees were planted, and we find trees on Kentish stock planted on poor, sandy, granite soil, and others on Mazzard stock on rich red soils. The positions would have been better reversed, for it has been found that the very heavy red soils at Young are not as suitable for Kentish stock as soil of lighter texture, but the poor sandy soil with a bad subsoil should be avoided.

The ideal situation is on a well-drained slope having a few inches of lighter topsoil with a red or yellow subsoil. The subsoil in this case is usually moisture retentive if the topsoil is kept well worked.

For all recent large plantings the ground is being deeply subsoiled prior to planting to a depth of from 18 to 20 inches; with earlier plantings 9 to 10 inches was deemed sufficient. It is hoped that with the deeper working the trees will establish a better root system, and thus their effective bearing life will be increased. There have been instances where deep cultivation after planting near the trees during hot weather has been injurious, and in some instances the trees died later in the season as most of the fibrous roots were severed. In these cases a shallower cultivation near the trunks of the trees would have been preferable.

In the past many orchards were planted with the trees from 16 to 20 feet apart, but the lesson learnt from the recent drought was that close planting is not desirable, and recent plantings are mostly as follows:—On Kentish stock, 20 feet by 20 feet, giving 108 trees per acre (still wider spacing of trees on Kentish stock would be preferable); on Mazzard stock, 25 feet by 25 feet, giving sixty-nine trees per acre.

It is likely that the pruning of heavy-bearing varieties could be practised to advantage; perhaps after the sixth year every second year would suffice. In one instance in the Young district pruned trees certainly showed to advantage. The trees were eight-year-old Burgdorff's Seedlings on Mazzard and Kentish stocks; those on Kentish stock had been pruned the previous year, while the trees on Mazzard were left unpruned. The yields were as follows:—

	Yield per Tree. ½-bushel cases.	Price Realised.
Unpruned trees	3	4s.
Pruned trees	1½	9s.

The quality was much better off the pruned trees.

For success in cherry-growing in the Young district the following are essential:—

1. Careful selection of situation, avoiding frost pockets and ill-drained situations.

2. Suitable varieties, and correct stocks for same.
3. Correct planting to ensure inter-pollination.
4. The marketing of only good quality fruit, carefully packed and with boxes well filled.
5. Working trees as low as possible to avoid a long trunk surface liable to sunburn. The best trees are those worked almost on to the roots, the union being below ground.

Infectious Diseases Reported in February.

The following outbreaks of the more important infectious diseases were reported during the month of February, 1932:—

Anthrax	1
Blackleg	3
Piroplasmosis (tick fever)	3
Pleuro-pneumonia contagiosa	1
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	Nil.

—Max Henry, Chief Veterinary Surgeon.

Onion Fertiliser Trial at Bathurst Experiment Farm.

In an onion fertiliser trial carried out last season at Bathurst Experiment Farm an application of 3 cwt. basic superphosphate per acre again proved the most profitable to use. Commenting on the results of the trial, Mr. G. T. Dawson, Experimentalist at Bathurst Farm, points out that since the trials have been in progress basic superphosphate and a mixture of equal parts of superphosphate and bonedust have shown up best, and further tests will be necessary before it can be definitely stated which is the better fertiliser for the onion crop in the Bathurst district under average seasonal conditions. Basic superphosphate has been under trial for two seasons, and the average net gain as compared with unfertilised plots has been £5 3s. 8d. per acre. During the three years that the superphosphate-bonedust mixture has been under test the average net gain has been £5 1s. 9d. per acre. No other fertiliser tried has shown even half these gains.

Preservative Treatment of Fence Posts.

Just issued by the Division of Forest Products of the Council for Scientific and Industrial Research, a publication on the above subject gives valuable information as to a cheap and effective method of prolonging the life of fence posts. Though special reference is made to Western Australia, the recommendations apply also to fence post timbers in other States.

Copies of the publication will be supplied free on application to the Division of Forest Products, 314 Albert-street, East Melbourne.

Leaf-fall of Bananas.

EXPERIMENT INDICATES CONTROL BY MANURING.

C. J. MAGEE, M.Sc., B.Sc.Agr., Assistant Biologist, and A. L. FITZPATRICK, Banana Inspector.

THE name leaf-fall has been applied to a disease which has occurred during the last year or two in certain plantations in the Tweed Valley. The disease has so far only made its appearance in plantations which have been established on old pasture and sugar-cane land.

Owing to the ravages of the bunchy-top disease during the period 1918-1926, banana growing as an industry practically disappeared in the Tweed Valley. Following on the work of the Bunchy Top Investigation Committee, with the elaboration by it of control measures which have since been proved to be effective, and the successful campaign conducted by the Fruit Branch of the Department in having these recommendations carried out, the industry has had new life infused into it. At present the Valley has as great an area under bananas as ever before, and bunchy-top plants are few and far between.

During the rehabilitation of the industry much virgin scrub and forest land was brought under cultivation to supplement and replace old areas, and in addition many areas which previously had been devoted to dairying and sugar-cane growing for periods of twenty years or more were planted to bananas. Leaf-fall disease has only appeared in plantations on this last-mentioned type of land. The disease was first brought under the notice of the Department during February, 1930, and during July of that year caused heavy losses in affected plantations. The disease again appeared in certain plantations during the winter of 1931.

Symptoms.

The disease takes the form of a premature withering and dying of the leaves in acropetal succession, *i.e.*, from the base of the plant upwards. The condition is confined almost entirely to relatively mature plants in affected stools, and is most pronounced in plants which have thrown a bunch. Young plants are apparently not affected to any great extent.

The early symptoms of the disease are not very well defined. This is due, in part, to the fact that the more mature bottom leaves of the plants, normally yellow, wither and die during winter months in this locality, and in part to the complication of symptoms by the presence of red spider (*Tetranychus telarius*) injury, which frequently accompanies leaf-fall. One of the first indications of dying of the leaves is the occurrence in the laminae of water-soaked areas of a somewhat oily appearance and often of considerable size. These areas enlarge and may extend from the midrib

to the margin; later they become brown and dry. Water-soaked areas also appear in the midrib and leaf stalks, and if the outer tissue is shaved off the internal tissues show a pronounced brown discolouration. This internal browning at first is in delimited areas, the long axes of which run parallel to the long axis of the midrib. The individual discoloured areas are separated by apparently normal tissue. The internal tissues of the leaf-stalk of an affected leaf at its junction with the pseudostem always show this discolouration and ultimately become mushy, causing the leaf to collapse at this point and fall over. In plants which have bunched every leaf may fall in this manner, and in less mature plants considerable defoliation may occur. Examination of the internal tissues of the pseudostem and corm of an affected plant reveals no abnormal features. The root system of such a plant is also apparently normal.

As mentioned above, leaf-fall has only been observed in plantations which have been established on old grass land or cultivation land which has been cropped to sugar-cane for many years. In one plantation a dividing line could be drawn between one affected area and a healthy section of the same plantation. This line was stated by the grower (Mr. P. J. Maher) to mark the boundary of an old cane area. In other plantations the disease made its first appearance sporadically throughout the plantation and later extended to involve considerable areas.

Cause of the Disease.

Laboratory examinations of tissues from diseased plants were made both at Sydney and at Murwillumbah. Pure cultures of a gram negative, gas-forming bacterium were obtained from the discoloured areas in the midribs and leaf-stalks. This organism appeared to be constantly associated with these areas, but could not be isolated from leaves which showed water-soaked areas on lamina and had not yet developed discoloured areas within the midrib. Inoculations of pure cultures of this organism were made into the midribs and leaf-stalks of leaves of relatively mature plants growing at the Sydney Botanic Gardens, but there were no indications that the bacterium was pathogenic.

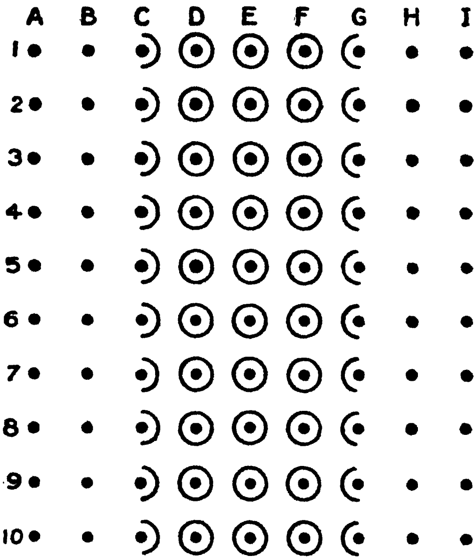
The opinion was formed that leaf-fall was possibly a physiological disease linked up with worn-out soil conditions, and arrangements were made to conduct a manurial experiment to test out the theory.

Manurial Experiment.

Messrs. G. E. Barnes and S. E. Baldwin, both of Terranora, co-operated with the Department in making a portion of the affected area in their plantations available for a manurial trial. The necessary manure was supplied through the generosity of the Tweed Banana Growers' Association.

The experiment was laid out according to the accompanying plan, the rows each consisting of ten stools in the case of Mr. Barnes' plot and five

stools in Mr. Baldwin's plot. Four and one-half pounds of a mixture containing equal parts of superphosphate, muriate of potash, and sulphate of ammonia were applied to each stool in the manured rows. Stools in the buffer rows received manure at the same rate, but on the inner sides of the plants only. Check rows were untreated. The first application of manure was made on 10th October, 1930, and by January, 1931, a distinct improvement in vigour was noticeable in the manured rows in both plots. In comparison with the unmanured rows there was much less tendency towards premature dying of the bottom leaves in maturing plants.



Plan of Manurial Experiment.

Rows D, E, and F received manure on both sides. Rows C and G received manure on inner side of plant only. Rows A, B, H and I (check rows) received no manure. The manure was spread evenly over the surface of the ground, rather than within a circle around each stool.

On 4th March, 1931, a further and similar application of the same fertiliser mixture was made on each plot. At the time of the second application the contrast between the manured and unmanured rows was considerable, and as the winter weather approached the contrast became more marked. An inspection made on 29th June, 1931, revealed very little trace of leaf-fall in the manured rows, while the unmanured rows were in much the same condition as during the previous winter. In addition, better class fruit was being carried by the manured rows.

The above experiment indicates that leaf-fall can be controlled by manuring. Almost similar results were secured in several other affected plantations, where growers manured their whole area during the spring of 1930.

Leaf-fall made its appearance in a number of additional plantations during the winter of 1931, indicating that the period during which the experiment was conducted was favourable to its development.

Farmers are invited to write to the Department of Agriculture, Box 36A, G.P.O., Sydney, for a copy of the "List of Publications." Most of the pamphlets listed therein are free, and have been framed to afford farmers a maximum of information in a minimum of space on almost every phase of agriculture.

Orchard Notes.

April.

C. G. SAVAGE and W. LE GAY BRERETON.

Growers of pome fruits in the later tableland districts will still be busy picking the late varieties. Some of this fruit will probably be held either in cold or common storage; but whether it is stored or marketed immediately, it should be scarcely necessary to reiterate the necessity for careful handling during all the operations, to avoid waste from bruises or broken skin. Though apples and pears are generally hard when picked, the skin is easily ruptured, and though the rupture may be barely perceptible, it is a point of entry for the various decay germs. This matter has been more fully dealt with in these notes earlier in the season.

Soiling.

The citrus grower will not be commencing to pick his orange crop till late next month and the autumn is generally a convenient time for him to carry out resoiling. It should be remembered, however, that not only citrus trees are benefited by resoiling, but that many of our deciduous orchards, especially on hillsides, would be much improved in their cropping if resoiling could be carried out. In some districts soil for this purpose is easily accessible, and the cost of applying it is the only deterrent, and cost is a matter that cannot, of course, be overlooked. During slack times, however, parts of the orchard could be soiled without any extra cost for labour.

Planting.

Those intending to plant this season should not delay any longer the preparation of the land, which for preference should already have been attended to. One of the main objects in early preparation (before April, if possible) is to give the land time to absorb any rains that fall. Planting can then be carried out whenever it is desired.

Clearing for an orchard should be very thorough, and roots should be run to a depth of at least 18 inches. Thorough clearing is especially essential in our coastal and tableland districts, where the root fungus *Armillaria* is liable to be present on the native timber and later attack the orchard trees. The land should be deeply ploughed, and where a stiff subsoil exists should be subsoiled. Although the clay will gradually compact again to its original condition, subsoiling allows a better penetration of water for the first few years after planting, and thus enables the roots of the young trees to penetrate further and become better established. Subsoiling, moreover, is the best detector of roots missed during clearing.

In the case of old paddocks infested with couch or other persistent weeds an endeavour should be made to eradicate such weeds before ploughing deeply, or they will be turned so far under as to render it next to impossible to destroy them, and they will be an endless cause of trouble.

In those parts of our coastal districts not liable to frost, citrus trees may still be planted during the early part of April. Planting of deciduous trees should not be started until they are dormant and have dropped their foliage, and can be continued during the winter, provided it is completed before the buds begin to swell. Though a good stand of deciduous trees can be obtained from planting in the late winter, however, there is a decided advantage, if soil is in good, moist condition and not overwet, in planting as early as possible after the young trees have dropped their leaves. Even after their leaves are shed, during warm spells in the winter deciduous fruit trees will make fresh root growth, and it is an obvious advantage if this root growth takes place after the tree is in its permanent position. Hence preparation of the land should be carried out and orders placed for the young trees well in advance of planting time.

Pest Control.

Where red scale of citrus trees has not already been dealt with, fumigation may still be carried out.

Codling Moth.

Apple and pear growers, whilst busy harvesting the last of their crop, are apt to forget the codling moth, but they should remember, as frequently pointed out in these notes, that it is the codling grub carried over from this season that is the start of all the trouble next season. Every endeavour should therefore be made to reduce the carry-over grubs to the absolute minimum. All infested fruit should be promptly destroyed by boiling, and this must be done promptly, before the grub has left the fruit.

Coming Agricultural Bureau Conferences.

Attendances at the Agricultural Bureau district conferences this year have seldom—in many cases never—been surpassed. Perhaps this is due to the fact that farmers and urban dwellers are only now learning that they are welcome to attend and join in the discussions whether they are Bureau members or not. All are invited.

The South Coast and Monaro branches are holding their conference at Cobargo on 28th and 29th April, and the Lower North Coast branches at Maitland on 5th and 6th May. The Annual State Conference is to be held at Hawkesbury Agricultural College, Richmond, on 26th, 27th, and 28th July next.

TUBERCLE-FREE HERDS.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 „ 1932
P. M. Burtenshaw, Killean, Inverell	50	5 „ 1932
Miss Brennan, Arankamp, Bowral	10	6 „ 1932
G. A. Parish, Jerseyland, Berry	123	13 „ 1932
Lunacy Department, Parramatta Mental Hospital	33	16 „ 1932
Cowra Experiment Farm	32	24 „ 1932
Hawkesbury Agricultural College (Jerseys)	115	25 „ 1932
Rydalmere Mental Hospital	73	25 „ 1932
Russell Lamrock, Orange	4	26 „ 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 „ 1932
St. John's Boys Orphanage, Goulburn	9	26 „ 1932
Marion Hill Convent of Mercy, Goulburn	9	26 „ 1932
St. Michael's Novitiate, Goulburn	5	26 „ 1932
Lunacy Department, Kenmore Mental Hospital	79	27 „ 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 „ 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 „ 1932
James Wilkins, Jerseyville, Muswellbrook	39	28 „ 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 „ 1932
Tudor House School, Moss Vale	8	3 May, 1932
Australian Missionary College, Cooranbong	53	6 „ 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 „ 1932
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Grafton Experiment Farm (Ayrshires)	193	4 „ 1932
Hurlstone Agricultural High School, Glenfield	58	9 „ 1932
P. Ubrihien, Corridgeree, Bega	133	3 July, 1932
St. John's College, Woodlawn, Lismore	32	11 „ 1932
Gladesville Mental Hospital	40	14 „ 1932
William Thompson Masonic School, Baulkham Hills	45	16 „ 1932
W. Hammond, Bellingen	68	16 „ 1932
W. R. Boughton, Holbrook	22	27 „ 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	31	28 „ 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	13 Aug., 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	14 „ 1932
A. L. Logue, Thornbro, Muswellbrook	41	14 „ 1932
E. R. Winder, Wybong Road, Muswellbrook	46	14 „ 1932
A. Shaw, Barrington (Milking Shorthorns)	100	20 „ 1932
A. H. Webb, Quarry-road, Ryde	4	24 „ 1932
E. E. McMullen, Springbrook, Holbrook	32	25 „ 1932
F. P. Perry, Nundorah, Parkville (Guernseys)	30	25 „ 1932
Sacred Heart Convent, Bowral	10	26 „ 1932
Department of Education, Gosford Farm Homes	88	2 Sept., 1932
James McCormack, Tumut	98	9 „ 1932
Wagga Experiment Farm (Jerseys)	64	16 „ 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 „ 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 „ 1932
St. Patrick's College, Goulburn	7	21 „ 1932
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 „ 1932
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 Nov., 1932
Wolaroi College, Orange	11	19 „ 1932
Lunacy Department, Callan Park Mental Hospital	31	20 „ 1932
Berry Experiment Farm	129	26 „ 1932
J. L. W. Barton, Wallerawang	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood	8	3 „ 1932
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 „ 1932
Lunacy Department, Morisset Mental Hospital	27	7 „ 1932
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 „ 1932
Newington State Hospital and Home	100	17 „ 1932
W. T. Herbert, Racecourse Farm, Bega	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega	78	8 „ 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 „ 1933
H. A. Corderoy, Wynna Park, Barrington, via Gloucester (Guernseys)	80	22 „ 1933
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 „ 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 „ 1933
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
New England Girls' Grammar School, Armidale	29	3 „ 1933
Lidcombe State Hospital and Home	149	3 „ 1933
G. L. Genge, "Easton," Armidale	33	4 „ 1933
George Ross, Aylmerton	3	23 „ 1933
Riverina Welfare Farm, Yanco	89	24 „ 1933
Department of Education, Yanco Agricultural High School	39	24 „ 1933
Mittagong Farm Homes	36	24 „ 1933

—MAX HENRY, Chief Veterinary Surgeon.

Poultry Notes.

April.

E. HADLINGTON, Poultry Expert.

On poultry farms where it is intended to hatch the coming season's chickens the selection of breeding stock should be the main consideration this month in order that the birds will be completely settled down in readiness to make an early start with hatching operations. There need be no hesitation about commencing to set eggs of either heavy or light breeds by 1st June. In fact, a week or so earlier is better than hatching after the end of September.

For the benefit of newcomers into the industry it may be stated that although arguments are frequently advanced against early hatching, owing to the fact that the birds, particularly the light breeds, hatched out in June and July break into a partial moult early in the following year, there are other considerations which outweigh this objection. In the first place, the surplus early cockerels can be marketed before the glut season commences, and if well grown (the early cockerels usually are) they realise higher prices at a younger age than those hatched later. Moreover, those reserved for stud purposes will be old enough to breed from at the beginning of the next season. The same applies to early pullets with regard to breeding from them the following season, and as they should come on to lay by November the egg production will be considerable by the time they commence to moult, about February or March of the next year, and they are all the better as breeders for having had a spell before the breeding season.

Breeding from Cockerels and Pullets.

The question as to whether cockerels or pullets may be used to breed from is frequently raised, and while it can be stated definitely that there is no objection to this practice, certain qualifications are necessary, as it is essential that both must be well grown, fully developed birds of at least ten months old. As a matter of fact, most poultry farmers who desire early chickens find it necessary to use pullets to obtain sufficient eggs for early hatching, owing to the fact that the hens are not in laying condition. Unfortunately, in some cases, the pullets used do not all come up to the requirements stated above, and the result is weak chickens. Where practicable, it is preferable to use male birds a year older than the pullets, but often these male birds are not in good condition when required and poor hatching results.

Points in Selecting Breeders.

Very few poultry farmers appear to have any set rule in handling birds intended for the breeding pens, and the result is that many birds are included which should be rejected on account of serious defects, such as

crooked breasts or toes, feathers on shanks or between toes, and side sprigs on combs, &c. If a definite procedure were followed in the examination of the birds before they were passed for the breeding pens such faults would not be overlooked. The following is a good practice in selecting stud birds, and after adopting the procedure outlined for a short time it becomes routine in handling birds.

Type and Size.—In the first place, before catching each bird, type and size should be considered and also general appearance, which should be alert and active, taking into consideration, of course, the condition of the bird at the moment. For instance, if it is recovering from a moult it will not be as fresh as one which is in the best of health. Also any deformities, such as roach back or wry tail, should not be overlooked.

Handling the Bird.—Upon catching the bird, the legs should be held in the right hand with the head downwards and breast outwards, and the thumb and first finger of the left hand should be run along the breast bone, holding the thumb on one side of the bone and the finger on the other side. This will be found a quicker and more effective method of detecting a crooked breast than by holding the bird in a horizontal position and feeling along the breast. Next, examine the legs and feet for feathering and crooked toes.

Head Points.—Attention should then be given to the head points, which are the best guide to productivity. The eyes should be large and should stand out prominently so that they can be seen when looking down upon the bird's head from above. Of course, it will not be possible to select all birds with such prominent eyes, but those which have a thick skull and heavy overhanging eyebrows should be rejected, together with those having puckered or wrinkled faces, making due allowance for age, as the older the bird becomes the greater is the tendency to coarseness in the head. Consideration should also be given to the texture of comb and wattles, and, while excessive roughness and beefiness should be avoided, there is no necessity to go to the extreme of looking only for those with combs and wattles of glassy smoothness, as in some cases there is a tendency to weakness in such birds.

Finer Standard Points.

Those who wish to breed birds of quality should pay attention to the finer points, such as formation of the comb and the colour of eyes and face.

Formation of Comb.—The ideal comb in single-combed breeds has five serrations, which should increase in height and width towards the centre of the comb and reduce again towards the back, where it should be nicely rounded off and, in the case of male birds, stand clear of the neck feathers. There is no objection to a comb having only four or as many as six or seven serrations, provided they are evenly formed and spaced. The comb of the male should be upright and as free as possible from wrinkles or depressions called "thumb marks," while side sprigs, which usually grow out of the sides of the comb at the back, should not be tolerated. Small upright combs

are looked for in the females of the heavy breeds, while in light breeds the comb should fall gracefully over on one side without any fold across the head.

Colour of the Face.—In most breeds the colour of the face of either males or females should be red, without any whiteness showing in the skin. This fault is more common in light than heavy breeds and is difficult to eliminate when it has become common in a flock.

Plumage Colour.—An examination of the plumage should be made to see that there is no foreign colour in the feathering, such as brown or black in birds which should be white, or white, gold or red colour in those which should be black. In the white breeds "straw colour" or "brassiness" on the outer surface of the feathers on the back should be avoided, but "sappiness," which is a sulphur colour usually found in the new feathers, should not be confused with brassiness, as this colour bleaches out when the feathers are fully grown.

The foregoing are all factors which should be taken into account in breeding birds to combine good quality with high productivity, and after all it is much more interesting and can be made more profitable, to breed birds of quality as well as heavy producers, and any doubt that this cannot be done can be dispelled, as ample proof is to be found on many commercial poultry farms.

Flock Matings.

Many poultry farmers adopt the system of "flock mating" instead of going to the trouble and expense of using single breeding pens comprising one male and eight to ten females. It should be remembered, however, that the same uniformity as regards type and laying character cannot be obtained in a large flock mating, therefore every farmer should endeavour to have at least a few single breeding pens for producing birds for the breeding pens the following year. It is only by following this practice that improvement can be effected in the quality and physique of the stock. The birds bred from flock matings should only be regarded as layers and should not be utilised for the best breeding pens.

Attention to Breeding Stock.

After the birds have been selected for the breeding pens it is essential that they be properly managed and cared for to ensure the best results. An examination should be made, particularly of the male birds, to ascertain whether they are infested with body lice and, if so, they should be treated at once. A quick method of dealing with this parasite is to paint a thin line of nicotine sulphate along the top of the perches shortly before the birds go to roost at night, but where the male birds only are affected these can be treated by dusting with flowers of sulphur. This can be done by using a shallow wooden tray large enough to lay the bird upon and to catch the surplus sulphur, which can be used again. Sulphur should be thoroughly dusted through the feathers to the skin and the whole of the body should be dusted.

An inspection of the houses should be made for the presence of red mite, and if found in the walls of the house a couple of sprayings with kerosene emulsion should be given, while the perches may be painted with creosote or wood preserving oil, taking care that the oil is applied early in the day so that the perches will not be oily when the birds go to roost, as this would cause them to become smeared with oil and so detract from their appearance.

Care of the Male Bird.

Particular attention should be paid to the male bird during the breeding season, as it frequently happens that he allows the hens to eat most of the food and does not get sufficient for himself, consequently losing condition, which results in poor fertility and indifferent hatching results. It is a good practice, therefore, to feed the male bird by himself at midday, shutting the hens in the houses and leaving him in the yard. Whole maize should be given, and he should be allowed about an hour to eat it.

Care should be taken not to use too much concentrates in the ration for breeders, as this frequently causes poor hatching results. It is inadvisable to use more than 5 per cent. of meat meal or other concentrates of similar protein value.

INCREASED SLAUGHTER AND EXPORT OF MUTTON AND LAMB.

PRIOR to 1929-30, the number of sheep and lambs slaughtered had been below 6,000,000 since 1913. The number of lambs slaughtered in 1930-31, namely 1,600,000 approximately, was the largest ever recorded in New South Wales. The continued heavy slaughtering under favourable seasonal conditions such as prevailed in 1930-31 is very unusual (especially following a year of drought), and is doubtless a consequence, in part, of the extremely low prices ruling for wool and wheat. There has, however, been a revival of fat lamb raising.

The increased slaughtering and oversea export or frozen meat during the past four years is shown below:—

Year ended June.	Number slaughtered in N.S.W.			N.S.W. Direct Oversea Exports. (Frozen and chilled.)		
	Sheeps.	Lambs.	Total.	Mutton carcases.	Lamb carcases.	Total.
1928	3,872,984	1,136,527	5,009,511	179,665	368,922	548,587
1929	3,873,905	1,093.930	4,967.835	252,318	296,819	549,137
1930	4,774,000	1,553,000	6,327,000	382,000	603,413	985,413
1931	4,500,000*	1,600,000*	6,100,000*	310,438	667,806	988,244

* Estimated.

REDUCTION in numbers of wheat varieties is in the best interests of all concerned in the wheat-growing industry, and such a result is best brought about by each grower (and, further, each group of growers) deciding which wheats are most suited to local conditions.

Editors of Agricultural and Country Papers are especially invited to reproduce any of the articles contained in the* AGRICULTURAL GAZETTE, *in whole or in part, making the usual acknowledgment.

Contributions are only accepted upon the terms that the Government may subsequently publish the same in pamphlet form or otherwise.

1st *May*, 1932.

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Agricultural Gazette of New South Wales.

The Buffalo Fly.

(*Lyperosia exigua* de Meijere.)

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon, and
Wm. B. GURNEY, B.Sc., Entomologist.

THE buffalo fly (*Lyperosia exigua*) resembles the ordinary house-fly in general shape and appearance, but is only a little more than half its size. It is dark-grey to brown in colour, has one pair of wings and a piercing and sucking proboscis. It feeds on the blood of cattle, and, to a lesser extent, on horses, mules, and donkeys. It is recorded that, normally, it does not attack marsupials, sheep, goats, pigs, dogs, or rabbits. Both the males and females suck blood, and they settle or crawl on the animals during both night and day, and rarely leave their hosts except when disturbed, or when the females go off to lay eggs on excrement. Whether feeding or resting they frequent the neck, shoulders and rump of the animals, and in order to feed, push their way down into the hair and insert the proboscis, holding the body in an almost erect position with reference to the skin of the host. They fly with great speed, and perhaps long distances, as it has been recorded that they apparently flew across the water to Mornington Island in the Gulf of Carpentaria, a distance of 40 miles.

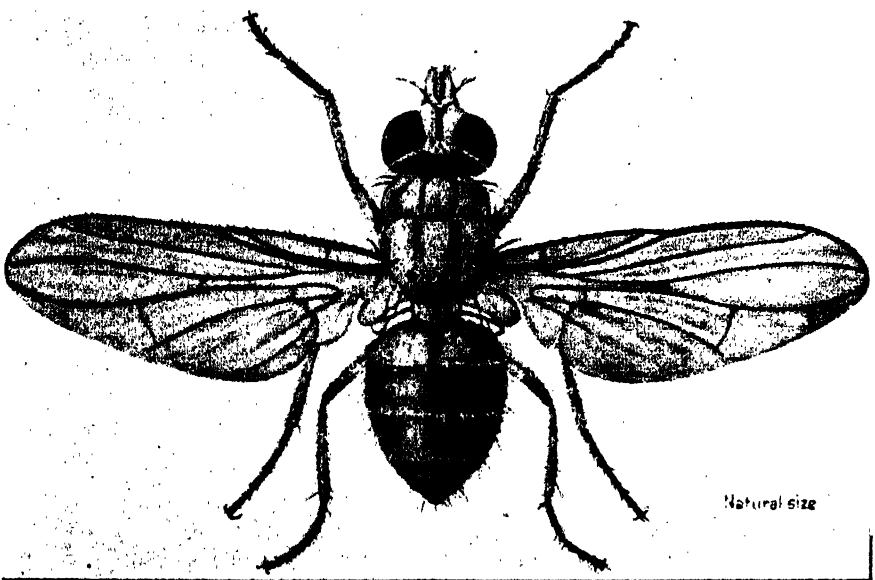

Fig. 1—Buffalo Fly (*Lyperosia exigua*). [*After Patton and Cragg.*

Life History.

The Egg.—The small, whitish, elongated egg (about 1.13 mm. long) is deposited by the female in freshly-dropped dung of cattle and buffaloes. The dung of native animals or of horses is rarely, if ever, used as a medium for development of the maggot. Fresh, moist dung is preferred, and the females leave the animals to lay their eggs therein. According to Patton and Cragg each egg is laid singly by the female, about twelve being so deposited on manure. The female may then return to its host and later lay further batches of eggs. Numbers of eggs are, therefore, laid by each female, and under suitable conditions of humidity and temperature the egg may hatch in eighteen to twenty-four hours. Hot sunlight and dry conditions are harmful to the development of both the eggs and the larvae.

The Larva.—The larva is a whitish maggot, about ¼ inch long when full grown and similar in shape to the blowfly maggot, but of much smaller size. The head is narrow and the body thickens towards the posterior end. It may develop to a full-grown maggot in three to five days.

Fig. 2.—Larva of the Buffalo Fly (x 12).

[*After Tillyard.*

The Pupa.—The full-grown maggot forms a puparium and changes to the pupal stage either in the dung or in the soil nearby. The pupal stage again occupies a period of only from three to five days under favourable conditions, and then the adult fly emerges and flies off to suck blood and to continue the life cycle.

The Life Cycle.—The development, from the laying of the egg to the emergence of the adult fly, under suitable conditions of humidity and temperature, may occupy only seven to eleven days, but with less favourable conditions a longer period is required for development, especially during the cooler winter months.

Distribution of the Fly.

The species, *Lyperosia exigua,* is known from India, the East Indies, northern Australia, the north of Western Australia and Queensland. It is allied to *Lyperosia irritans,* the "horn fly" of the United States and Hawaii, to which countries it was originally introduced from Europe. A third species, *L. minuta,* is found in the Soudan, the Transvaal and Zanzibar, and has proved a harmful pest of cattle in this last-mentioned territory.

The buffalo fly is thought to have been introduced into Australia with buffaloes landed at Darwin. Buffaloes were first introduced somewhere about 1826, and either then, or at a later period, the buffalo fly became established; but it was not till 1911, according to Hill, that it attracted attention as a pest of cattle in the Northern Territory. The range of the buffalo fly in 1911 was from the Liverpool River on the east to the Daley River on the west, and from the Roper River on the south to the northern coastline.

From 1911 to 1926 extensive movements of cattle occurred in northern Australia, and Murnane recorded the range of the buffalo fly as from Broome, in Western Australia, to the Robinson River on the east. In 1928 the fly first crossed into Queensland on the far north-western border, and it has since spread south-eastward in Queensland to the Leichhardt River, and now, in 1932, is well eastward of this river and is a most serious menace to Queensland, and, incidentally, to New South Wales, should its spread not be held up.

The buffalo fly is more prevalent in rainy seasons, and in the Northern Territory commences to become numerous in November, till a maximum is reached in January and February; later, the numbers decrease gradually until May and June. If the winter months are dry, scarcely any buffalo flies can be found at all.

Influence of Climate on its Spread.

During the last few years considerable apprehension has been expressed by Government officials and by stockowners regarding the spread of the buffalo fly in Australia.

It appears fairly evident that climatic conditions in the inland parts of Australia have prevented the spread of the fly directly southwards. It has been generally held that climatic influences and particularly lack of rainfall would prevent the establishment of the pest. The rainfall line usually associated with these limits is the 20-inch line, but in Western Australia at least, there is considerable evidence to the effect that the fly may establish itself well below this line, as it has been found to occur at points on the Western Australian coast with a 10-inch rainfall. Whether this will mean a permanent establishment or not remains yet to be seen, but in the meantime the presence of the fly offers a very definite opportunity for it to be carried through a belt of comparatively low rainfall to areas further south in which the rainfall is heavier. In Queensland the fly does not yet appear to have extended anywhere south of the 20-inch rainfall line, but it is spreading steadily in the direction of that limit, and unfortunately it is approaching the railhead at Kajabbi, a trucking station on the railway line running northwards from Cloncurry. It is quite obvious that once the buffalo fly reaches a railhead, spread will be fairly rapid unless definite steps are taken to prevent the movement of the fly with the cattle. There appears to be a very distinct danger that it may spread by cattle on the hoof in an easterly direction from the infested areas of Queensland, and might so reach the coast across the southern limits of Cape York Peninsula. In Western Australia, providing its movement along the narrow belt of coastal

country is prevented, there appears to be no danger of its movement south, nor is it likely to move south overland through northern and central Australia much beyond its present limit. Should the rail, which has now moved northwards to Alice Springs, be taken further north into the moister parts of the Northern Territory, an additional danger will arise.

Effect of Buffalo Fly on Cattle.

In those countries (such as Java) in which the buffalo fly has been long established, it is looked upon with little concern, partly no doubt because there exists in such countries a balance of nature which prevents the multiplication of the fly to excessive numbers. Judging from the manner in which it has multiplied in north Australia, this balance of nature does not exist here. It may be that it will be possible to create some such balance by the introduction of the natural enemies of the fly in the shape of parasites or predators, but the establishment of such enemies must be a matter of considerable time, and there is no guarantee that it can be brought about. If, therefore, the fly when present in excessive numbers has a deleterious effect on cattle, it is evident that other steps must be taken to prevent its spread whilst attempts are being made to create the balance referred to above.

Now the buffalo fly, although of small size, is a blood-sucker and its presence irritates the cattle. In bad seasons in north Australia it attacks the cattle in clouds. The amount of blood withdrawn becomes considerable when the flies are present in such countless numbers. The irritation caused leads to the cattle damaging themselves by rubbing and scratching, and sores are frequently formed which may lead to further trouble. The putting on of condition must be retarded to some extent, depending on the length of time for which the fly is present in large numbers and the feed available to the cattle to make up for the loss sustained. It has been pointed out that involved stations in the north continue to produce, and even fatten cattle, and it is sometimes argued that the fly does not cause the damage which is credited to it. The point that appears to be missed is that more fat cattle might be produced were the fly not present. Moreover, it is unsafe to argue from the effects of the buffalo fly on beef cattle, what the effects would be on dairy cows. In order to produce the maximum, a dairy cow requires rest and comfort. If she is continually subjected to the attacks of a number of blood-sucking irritating insects, that rest and comfort will be seriously disturbed and she will not produce to her maximum capacity.

It has been suggested that the mosquito also does these things and that no control of movements of cattle are enforced because of the presence of the mosquito. This is admittedly so, since excepting in small areas, particularly urban areas, control of the mosquito is barely practical in Australia. If, however, the mosquito were confined to one portion of Australia, as is the case with the buffalo fly, there would be justification for taking such steps as might be practical to prevent its movement elsewhere.

It appears illogical to argue that because the buffalo fly is present in one part of Australia it should be allowed to spread to other parts without let or hindrance, particularly since those areas to which it is most likely to spread are the very areas in which it may cause the greatest damage. It is, therefore, desirable to consider by what possible means the spread of this fly could be prevented.

Control Measures Taken in Western Australia.

In Western Australia the State finds itself in a fortunate position, inasmuch as the only method, apart from the coastal route referred to, by which the fly could reach cattle areas to the south of those already infested, is by boat. The Government has, therefore, provided facilities for spraying the cattle immediately before they are placed on the boat at the northern ports, and although it has not been quite 100 per cent. effective, this line of action has been remarkably successful in ensuring that the cattle when unshipped at southern ports are not accompanied by fly. Several types of repellent have been used, some of which have not only driven the fly off the beast, but also destroyed the fly whenever the insect is thoroughly wetted by them. The Western Australian Government is still experimenting with the idea of obtaining a more effective agent for this work. It would seem, however, that even at present there would be good reason for supposing that a double spraying carried out under appropriate conditions might be an almost complete safeguard.

In order to apply the spray, long crushes have been erected on the wharves of the northern ports, through which the cattle are passed direct on to the boats, and whilst passing through they are subjected to a spray given out under pressure which comes in contact with all parts of the animals' bodies. In view of the success which has attended this method of control, it is natural that consideration should be given to the application of the method on land. It is hardly practical to provide effective treatment for cattle moving on the hoof, but there seems no reason why it should not be applied to cattle immediately before trucking, as long as arrangements are made to move the train off as soon as the cattle are on board. Subsequent treatment of these cattle would depend on the conditions of transit, and it should not be difficult to provide at some point of the railway journey for the cattle to be untrucked and reloaded after a second spraying with the idea of destroying any fly which might have persisted after the first treatment. Whilst alone this method of control might not permanently prevent the spread of the fly, it would offer a hope of preventing or of reducing the rate of spread so as to give years of further freedom to the country not yet infested.

Danger of Introducing the Fly in Manure.

In connection with these cattle movements, there is one other point of importance which will be clear if the life history of the fly as given previously is studied. It will be seen that the eggs of the fly are laid in the manure of the cattle, where the necessary warmth and moisture are found

to enable the fly to complete its life history. It was clear that, so far as the transport of the fly was concerned in Western Australia, the manure on the boats provided a possible means of introducing the fly at the ports where the cattle were landed if, as was the case, this manure was also landed for use on market gardens. It therefore became necessary to regulate the utilisation of this manure in such a way as to minimise the danger of introducing the fly. This is not difficult where transport by boat is concerned.

Transit by rail offers a more difficult problem, but here again arrangements could be made at a suitable spot where the cattle are untrucked to remove all the manure from the cattle trucks and deal with it in such a way as to prevent the further development of the fly from it. As the majority of the flies would have been dealt with at the first spraying, the danger of further spread by means of the manure would have been already decreased and the prevention of spread by this means could be made sure by appropriate treatment of the manure. As this cleansing of the trucks would take place within a very few days after the cattle were placed in the trucks, there would be no time for the fly to emerge during transit.

Preventive Measures.

It is obvious that the danger of the spread of the fly increases in direct ratio to the number of varying directions of the routes which the cattle travel, and the concentration of cattle movements on to a smaller number of routes would automatically simplify control methods and tend to retard the spread of the pest. If by good fortune these stock routes to which the cattle would be restricted led through a considerable area of elevated country, or country with a low rainfall, this might even lend to a complete bar to the further spread of the pest.

Whilst all these measures are practicable and of very considerable value, it would appear that the most effective method of preventing the onward march of the fly would be the creation of a buffer area fenced on both sides of probably about 30 miles width and kept empty of all stock. Such a method of control could have been adopted a few years ago with every hope of success. So far as Western Australia is concerned, it is still feasible. In Queensland the fly has already penetrated so far into the cattle country as to render its application a very expensive matter; so expensive as almost to force it to be regarded as impracticable.

It is still considered possible that by taking action in the way of spraying cattle at railhead, and again en route (unless the work now being carried out in Western Australia results in the production of a reasonably cheap and thoroughly effective killing and repelling agent), and removing the manure from the trucks at an approved centre, the movement of the fly onwards can be retarded to a very great extent. Every year during which the dairying districts can be kept free from this pest means so much gain to the Commonwealth, and so much additional time for the possible development of biological control.

Biological Control.

Parasites and predators, if introduced from the East Indies or Asia, may reduce the numbers, though, of course, not eradicate the buffalo fly. Should such be established and prove of any value the reduction of the prevalence of the fly would, similarly, reduce the loss in cattle due to fly "worry."

Meanwhile, it is most urgent that measures be taken to prevent, as far as possible, the further spread of this serious pest by such steps as indicated.

For much of the information concerning the distribution and life history of the fly reference was made to publications by Messrs. G. F. Hill, D. Murnane, B.V.Sc., F. H. S. Roberts, M.Sc., and Dr. R. J. Tillyard.

THE NEW POTATO GRADES DEFINED.

RECENTLY amended regulations under the Plant Diseases Act, 1924, specify that there shall be five grades of potatoes, viz., "No. 1 Grade," "No. 2 Grade," "New Potato Grade," "Chat Grade," and "Seed Potato Grade." The regulations define these various grades as follows:—

"No. 1 Grade" shall consist of sound potatoes which shall have similar varietal characteristics and a mature skin; they shall be reasonably free from second growth, decay, mechanical injury, and greening from exposure, dirt and other foreign matter and from damage caused by disease, sunburn or insects, and shall be not less than three ounces in weight.

"No. 2 Grade" shall consist of potatoes which comply with the standard of No. 1 Grade except as to maturity of skin and weight. They may have either a mature or immature skin and shall be not less than one and a half ounces but less than three and a half ounces in weight.

"New Potato Grade" shall consist of potatoes which comply with the standard of No. 1 Grade except as to maturity of skin and weight. They shall not have a mature skin and shall be not less than three ounces in weight, except during the months of October, November, December and January, during which they shall be not less than one and a half ounces in weight.

"Chat Grade" shall consist of potatoes grown in New South Wales which comply with the standard of No. 1 Grade. They shall have an immature skin and be less than one and a half ounces in weight.

"Seed Potato Grade" shall consist of sound potatoes which shall have similar varietal characteristics and a mature skin; they shall be reasonably free from second growth, decay, mechanical injury, dirt, and other foreign matters, and from damage caused by disease, sunscald, or insects, and shall be not less than one and a quarter ounces in weight.

Potatoes shall be deemed to comply with the standard of a grade if at least ninety-five per centum by weight comply with that standard.

MANY farmers grow six or more varieties of wheat on their farms—all good sorts, but some better than others. This is a disadvantage, as, besides the direct loss from the lower-yielding sorts, more work is entailed when harvesting, and greater care is needed to maintain a purity standard of seed.

Drought Feeding Trials at Trangie.

DURING the years 1928–29 and 1929–30 trials with various feeds to determine suitable maintenance rations for sheep during drought periods were conducted with dry ewes at Trangie Experiment Farm (see this *Gazette*, June, 1930, page 458, and July, 1931, page 559). In November, 1931, it was decided to continue the trials, using pregnant ewes, to determine the effect of protracted hand feeding on such ewes and their progeny.

Four groups of five 4-tooth Merino ewes which had been mated between 6th October and 24th November, 1930, were selected for evenness of covering and body weight, and fed in bare yards with shelter for a period of 230 days.

The rations fed at the commencement of the trial (3rd December, 1930) were as follows:—

Group 1	... 2 lb. cereal hay per head per day.
Group 2	... 2 lb. cereal hay, plus 4 oz. oats per head per day.
Group 3	... 2 lb. cereal hay, plus 4 oz. maize per head per day.
Group 4	... 2 lb. cereal hay, plus 2 oz. oats and 2 oz. nuts per head per day.

Free access was allowed to a salt lick composed of Epsom salts 6 per cent., bone meal 15 per cent., and the balance Liverpool salt.

Owing to the large quantity of hay being left, a reduction to 1¾ lb. per head per day was made from 1st April. The condition of the ewes and lambs being low in May, the concentrates in Groups 2 and 3 were increased by 1 oz., and each concentrate in Group 4 by ½ oz. as from 1st June.

Excessive rainfall (particularly in the months of March to May, when a total of 1,384 points were registered) adversely affected the sheep.

At the conclusion of the trial the ewes in all groups, with the exception of one very poor sheep in Group 1, were in a strong healthy condition, thus confirming the conclusion of the earlier experiments that 1½ lb. good cereal hay per day is a satisfactory drought ration for sheep. There was, however, a marked difference in condition and appearance between the four groups. Group 4 was superior to any of the remainder, Group 1 was lowest in condition, while Groups 2 and 3 were equal to each other, inferior to Group 4, but superior to Group 1.

All the lambs born (four in each of Groups 1, 2 and 3, and five in Group 4) were strong and healthy at birth in March. Excessive rain at the time was no doubt the cause of the heavy mortality which followed; only seven lambs remained at the end of the trial (20th July, 1931)—two in Group 1, one in Group 2, three in Group 3, and one in Group 4. At that date the lambs were stunted and poor, typical of lambs reared under bad drought conditions. There was no noticeable difference between the lambs in any of the groups.

Owing to the abnormal weather conditions which caused such heavy mortality in lambs, no definite conclusions can be drawn in regard to the main object of the trial, *i.e.*, the effect of continued feeding of the rations on pregnant ewes and on the lambs.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
Tudor House School, Moss Vale	8	3 May, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 ,, 1932
P. M. Burtenshaw, Killean, Inverell	50	5 ,, 1932
Australian Missionary College, Cooranbong	53	6 ,, 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 ,, 1932
G. A. Parish, Jerseyland, Berry	123	13 ,, 1932
Lunacy Department, Parramatta Mental Hospital	33	16 ,, 1932
Cowra Experiment Farm	32	24 ,, 1932
Rydalmere Mental Hospital	73	25 ,, 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 ,, 1932
St. John's Boys Orphanage, Goulburn	9	26 ,, 1932
Marion Hill Convent of Mercy, Goulburn	9	26 ,, 1932
St. Michael's Novitiate, Goulburn	5	26 ,, 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 ,, 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 ,, 1932
James Wilkins, "Jerseyville," Sandy Creek Road, Muswellbrook	39	28 ,, 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 ,, 1932
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Grafton Experiment Farm (Ayrshires)	193	4 ,, 1932
Hurlstone Agricultural High School, Glenfield	58	9 ,, 1932
P. Ubrihien, Corridgeree, Bega	133	2 July, 1932
St. John's College, Woodlawn, Lismore	32	11 ,, 1932
Gladesville Mental Hospital	40	14 ,, 1932
Coast Hospital, Little Bay	66	15 ,, 1932
William Thompson Masonic School, Baulkham Hills	45	16 ,, 1932
W. Hammond, Bellingen	68	16 ,, 1932
W. R. Boughton, Holbrook	22	27 ,, 1932
Chapman Bros., Farm 160, Stoney Point, Leeton	31	28 ,, 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	13 Aug., 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	13 ,, 1932
A. L. Logue, Thornbro, Muswellbrook	41	14 ,, 1932
E. F. Winder, Wybong Road, Muswellbrook	46	14 ,, 1932
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns)	100	20 ,, 1932
A. H. Webb, Quarry-road, Ryde	4	24 ,, 1932
E. E. McMullen, Springnook, Holbrook	32	25 ,, 1932
H. P. Perry, Nunderah, Parkville (Guernseys)	30	25 ,, 1932
Sacred Heart Convent, Bowral	10	26 ,, 1932
Department of Education, Gosford Farm Homes	38	2 Sept., 1932
James McCormack, Tumut	98	9 ,, 1932
Wagga Experiment Farm (Jerseys)	64	16 ,, 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 ,, 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1932
St. Patrick's College, Goulburn	7	21 ,, 1932
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 ,, 1932
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 Nov., 1932
Wolaroi College, Orange	11	19 ,, 1932
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1932
Berry Experiment Farm	129	26 ,, 1932
J. B. Burtenshaw, "Sunnyside," Inverell	36	27 ,, 1932
Parker Bros., Hampton Court Dairy, Inverell	74	27 ,, 1932
W. K. Frizell, Rosenstein Dairy, Inverell	44	28 ,, 1932
J. L. W. Barton, Wallerawang	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood	8	3 ,, 1932
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 ,, 1932
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	9	3 ,, 1932
A. N. de Fraine, Happy Valley Dairy, Inverell	9	6 ,, 1932
W. Pigg, Redlands Dairy, Inverell	33	6 ,, 1932
Lunacy Department, Morisset Mental Hospital	27	7 ,, 1932
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1932
Newington State Hospital and Home	100	17 ,, 1932
W. T. Herbert, Racecourse Farm, Bega	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega	78	8 ,, 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 ,, 1933
H. A. Corderoy, Wynna Park, Barrington, via Gloucester (Guernseys)	80	22 ,, 1933
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 ,, 1933
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
New England Girls' Grammar School, Armidale	29	8 ,, 1933

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
Lidcombe State Hospital and Home	149	3 ,, 1933
G. L. Genge, "Easton," Armidale	33	4 ,, 1933
George Rose, Aylmerton	3	23 ,, 1933
Riverina Welfare Farm, Yanco	89	24 Feb., 1933
Department of Education, Yanco Agricultural High School	39	24 ,, 1933
Mittagong Farm Homes	36	24 ,, 1933
Liverpool State Hospital, Liverpool	72	3 March, 1933
Miss Brennan, Arankamp, Bowral	17	8 ,, 1933
G. W. Young, "Boorganna," via Wingham	41	10 ,, 1933
Lunacy Department, Kenmore Mental Hospital	79	27 ,, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra	20	6 April, 1933
Hawkesbury Agricultural College (Jerseys)	115	8 ,, 1933

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.

—**MAX HENRY, Chief Veterinary Surgeon.**

FAT LAMBS FROM COWRA FARM EXHIBITED AT THE ROYAL SHOW.

MUCH interest was evinced in the fat lamb carcases exhibited in the Metropolitan Meat Industry Board's pavilion at the recent Royal Sydney Show. Ten representative lambs of each cross under trial at Cowra Experiment Farm (for report of this trial see *Agricultural Gazette,* January, 1932, page 39) were forwarded to the Meat Industry Board in September last, the two most even carcases in each group being exhibited in their pavilion.

The average weights of the lambs forwarded to the Board and the values are shown hereunder:—

Cross.	Average weight (10 lambs).	Value per lb.
	lb.	d.
Southdown x Merino	28·1	5
Southdown x Comeback	31·6	4¾
Southdown x Crossbred	35·3	4½
Ryeland x Merino	32·1	4⅛
Ryeland x Comeback	33·5	4⅜
Ryeland x Crossbred	35·3	4½
Dorset Horn x Merino	31·6	4½
Dorset Horn x Comeback	36·5	4¼
Dorset Horn x Crossbred	37	4⅞

Mr. J. M. Coleman, Senior Sheep and Wool Instructor, points out that during the selection of these lambs at Cowra a number by Dorset Horn and Ryeland rams from crossbred and comeback ewes had to be discarded because they were too heavy and did not conform to export requirements.

Varieties of Oats in New South Wales.

[Continued from page 459.]

ALLAN R. CALLAGHAN, D.Phil., B.Sc. (Oxon), B.Sc.Agr., Assistant Plant Breeder.

ALGERIAN, Belar, Mulga, Guyra, Gidgee, Lachlan, Sunrise, Buddah, Myall, White Tartarian and Palestine have already been dealt with in this series of articles. In the present, as in previous instalments, the varieties are described in order of importance. Laggan, Burke, Fulghum and Kelsalls are featured this month.

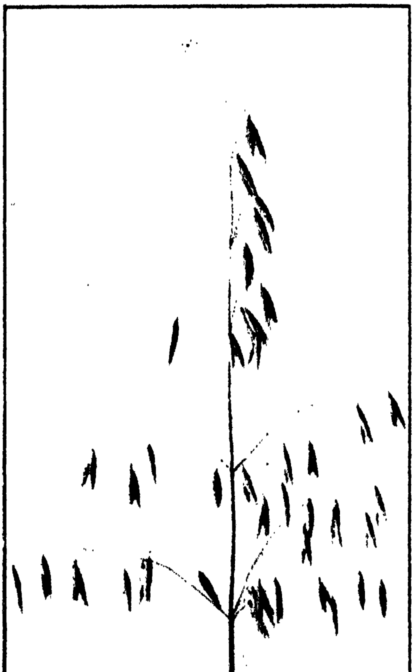

Fig. 28.—Panicle of Laggan.
It is of the normal pyramidal type with long branches.

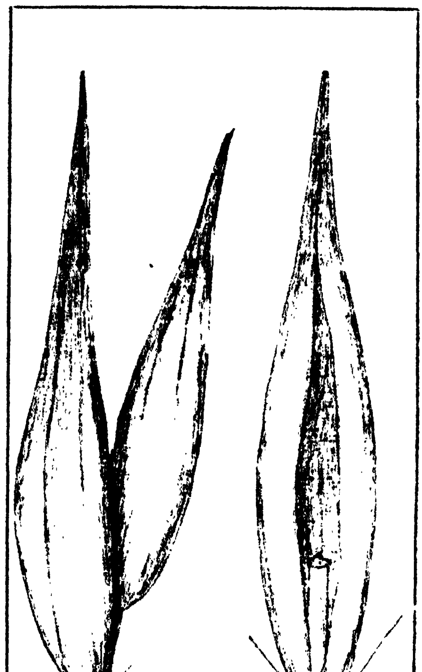

Fig. 29.—Spikelet and Grain of Laggan.
The primary grain of some spikelets bears a weak to intermediate awn, but the majority are awnless. Note, the solidified base and the rachilla with its surface of articulation.

Laggan.

Laggan originated at Wagga Experiment Farm, where it was selected from Kelsalls by Mr. R. J. Hurst. From the details of its original selection, and its subsequent breeding, it seems certain that its initial appearance was due to mutation. It was named in 1928.

This variety makes very rapid growth in its early stages. It has erect early growth with only moderate stooling (2½), and bears wide, light greyish-green foliage of definite individuality. The foliage is soft and glabrous. Its medium-tall to tall straw is fine and fairly strong with glabrous nodes.

Laggan has a larger equilateral panicle than the parent variety Kelsalls; it is of the normal pyramidal type. The rachis is usually fairly erect and the branches are long, but only slightly drooping, leaving the rachis at angles of from 45 to 60 degrees. The panicle is illustrated in Fig. 28. The spikelets are medium-sized and fairly evenly distributed over the panicle. Normally two grains develop per spikelet; the first of these may carry a weak to intermediate awn, but the majority are awnless. The base of the primary grain is solidified and the rachilla generally disjoins from the secondary grain, leaving a surface of articulation (see Fig. 29). A few basal hairs are present. These are fragile and never very noticeable. The colour of the grain is dark dun to almost black. There is an opinion prevailing that this dark colour is prejudicial to the favour of Laggan among farmers; such a prejudice, if it exists, has neither sane nor scientific foundation.

For a variety of very early maturity Laggan yields well both for grain and hay. In the drier areas of the wheat belt where short-seasoned oats have a distinct advantage, this variety is of undoubted value. Its very rapid early growth and soft, broad, abundant foliage make it very suitable as a silage crop and it is doubtful whether any early-maturing oat will prove as serviceable and as productive as Laggan for this purpose. As a grazing type it lacks recovery power and is not satisfactory.

Laggan is highly resistant to all forms of stem rust, but is very susceptible to crown rust and loose smut.

Burke.

This variety was received from Roseworthy Agricultural College, South Australia, in 1926 as a selection from Kherson. It was named Burke in 1928.

In early growth it is semi-erect, and for an oat of early maturity it has remarkably good tillering ability (3½). The abundant foliage is of a greyish-green colour, medium-wide to wide, and glabrous. It has very short straw, which is fine and only medium-strong; in spite of the latter its shortness enables it to stand very well under average conditions.

The large ovoidal panicle of Burke is shown in Fig. 30. The even distribution of the spikelets, the uniform angles (about 45 degrees) the branches make with the rachis, and the erectness of the branches give the panicle a well-balanced appearance. The spikelets are small and carried in semi-confused fashion. Although small the grains have thin husks, and are of good quality. They are light-brown in colour. The secondary grain normally disarticulates from the rachilla, the latter remaining on the primary grain. The base of the primary grain is only partially solidified, a slight surface of articulation being a regular feature of the variety. The combination of

articulating rachilla and intermediate base is unusual. Basal hairs are numerous, long, and distributed in two definite tufts. A weak to intermediate awn is borne by the primary grain of a few spikelets—the majority, however, are awnless. The grain characters are illustrated in Fig. 31.

Burke is an early maturing variety with good tillering, semi-erect early habit and exceptionally good recuperative powers, a combination which makes it an extremely satisfactory type for grazing. It has given promising results

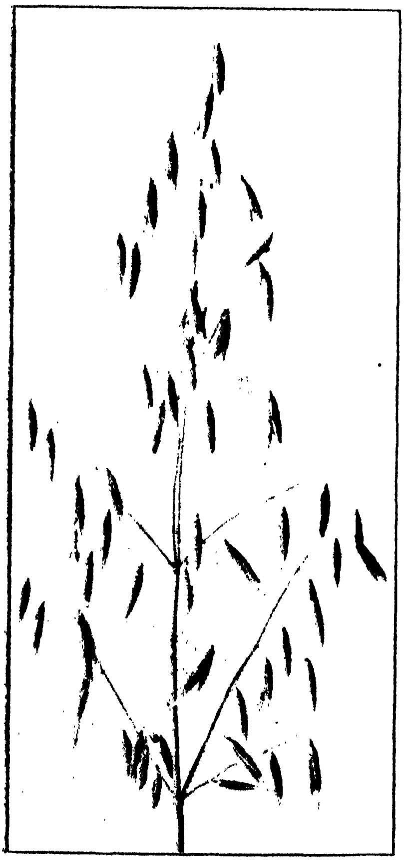

Fig. 30.—Panicle of Burke.
It is of large ovoidal type with semi-confused spikelet.

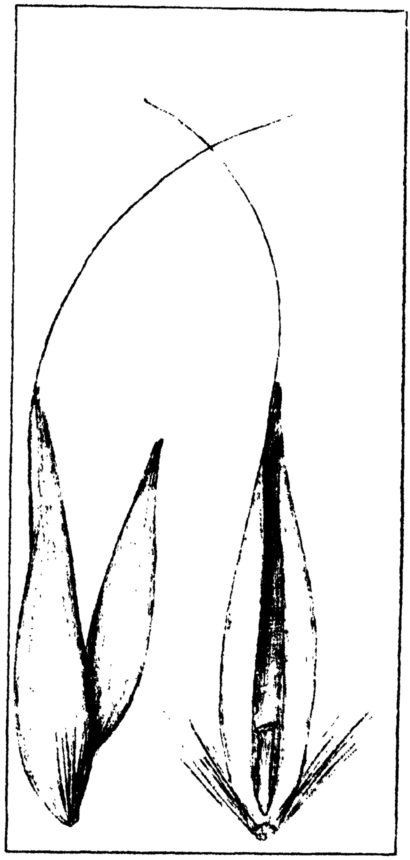

Fig. 31.—Spikelet and Grain of Burke.
Note the intermediate base and rachilla with its surface of articulation—rather an unusual association. Basal hairs are long and numerous.

both for hay and grain in the drier oat-growing districts of the State. Its short straw reduces its yield as a hay variety, but this is largely compensated for by good tillering. Burke is an oat that will not receive immediate acceptance as a feed oat on account of its small grain—a disadvantage that is

more imaginary than real—but its actual feeding value is probably equal to any of our varieties which, although they have larger grains, have thicker and coarser husks.

Burke is highly resistant to all forms of oat stem rust known in New South Wales, but susceptible to crown rust and loose smut.

Fig. 32.—Panicle of Fulghum.
The panicle is small and ovoidal, with short, fairly stiff branches.

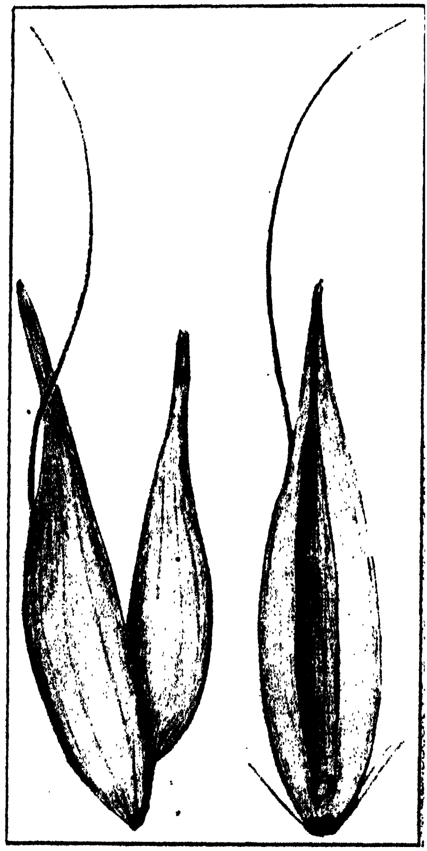

Fig. 33.—Spikelet and Grain of Fulghum.
Note the intermediate base, sparse basal hair development, and the fractured rachilla.

Fulghum.

Fulghum was introduced from the United States of America. According to United States records it originated about 1897 as a single plant selection from a field of Red Rustproof oats and is thought to have arisen as a natural cross. It is regarded as the most important variety of oats having its origin in U.S.A. The variety in New South Wales has proved very variable, affording an abundance of material for selection. This is also true of the

variety in America and one of its leading derivatives there is Kanota. The selections made in New South Wales, for the main part, breed true and appear to be definite mutant forms.

Semi-erect in early habit, Fulghum tillers abundantly with an index of 3½. One of its most noticeable characteristics is the bright light-green colour of its medium-broad foliage. The leaf-sheaths and leaf margins are hairy. The straw is medium-tall, slender, and rather brittle, which causes the crop to lodge under some conditions. The culms are tinged with purple; this is especially noticeable at the base of the plants.

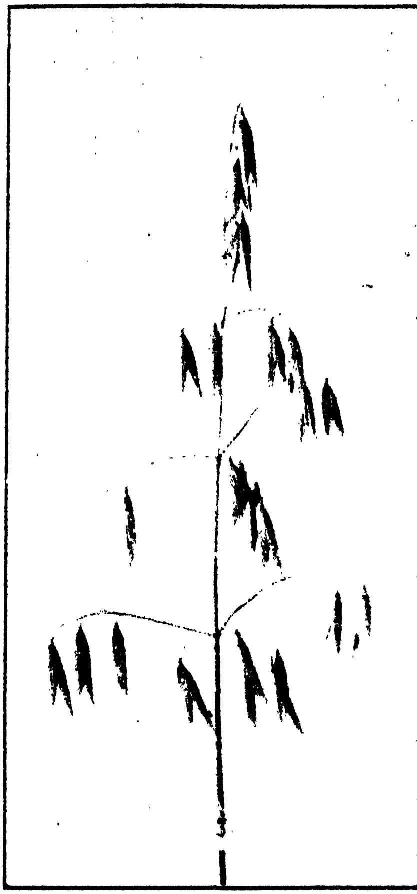

Fig. 34.—Panicle of Kelsalls.
The branches are slightly drooping and leave the rachis at from 70 to 90 deg.

The panicle is of medium size, of the ovoidal equilateral type and before ripening has a typical bright light-green colour similar to the foliage. The rachis is erect and the main branches leave it at angles of from 40 to 50 degrees and remain fairly rigid (see Fig. 32). The true grain colour of Fulghum is brown, but the grains vary somewhat in this character, dun mottlings on the brown background being not infrequent. The primary grain bears a weak to intermediate awn, but some spikelets in the panicle are awnless. A few fragile basal hairs are generally present on the base of the first grain; the rachilla fractures low down and is retained on the secondary grain, and the base of the primary grain is of intermediate description. These characters are illustrated in Fig. 33.

Probably the most useful character possessed by Fulghum from the Australian viewpoint is its remarkable powers of recovery after grazing, and combined with this it has excellent early growth characters and good tillering ability, which makes it pre-eminent as a grazing type. It is early-maturing and productive, both for grain and hay, but its weak straw is a serious handicap. Another feature limiting its value is its instability. While these factors prejudice its favour as an oat of general utility, its grazing potentialities are

outstanding. Besides affording a large amount of material for selection, it has been used to good effect as a parent, thereby forming the basis of some very useful and promising strains of oats, which, although not fully tested as yet, are expected to combine grazing excellence with good general agronomic characters.

Fulghum is highly susceptible to both stem and crown rust, but is resistant to loose smut.

Kelsalls.

Kelsalls was selected from a field crop by a Victorian farmer whose name the variety bears. No other information as to its origin is available.

Although very early maturing Kelsalls is semi-erect in early habit and tillers well, with an index of 3. It has medium-wide, glabrous foliage, and very short, fine, medium-strong straw. The culms are of a dark greyish-green and on maturity are dulled by a definite glaucousness.

Kelsalls has a medium-sized equilateral panicle of pyramidal shape. The branches are slightly drooping and leave the rachis at from 70 to 90 degrees; the rachis is erect (see Fig. 34). The small grain is bright yellow in colour. A weak to intermediate awn is carried by the primary grains of about half the spikelets, the remainder are awnless. The base of the primary grain is very small and practically solidified, and the second grain, as a general rule, articulates with the rachilla. A few basal hairs may be present at the base of the first or second grain, or both.

Kelsalls is too short in the straw for hay purposes, and is seriously lacking in recovery power, which reduces its value for grazing to a minimum. For grain it has yielded well, especially in the drier areas of the State where its early maturity gives it a distinct advantage. Because of its limitations as a hay and grazing oat, however, it is not at all likely to compete with more versatile types anywhere in the State.

It is extremely susceptible to stem and crown rust and susceptible to loose smut.

(To be continued.)

Infectious Diseases Reported in March.

The following outbreaks of the more important infectious diseases were reported during the month of March, 1932:—

Anthrax	1
Blackleg	6
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	3
Swine fever	Nil.
Contagious pneumonia	2
Necrotic enteritis	Nil.

—**Max Henry, Chief Veterinary Surgeon.**

Stem Nematode Disease of Lucerne.

With Review of Literature Concerning the Causal Organism *Tylenchus dipsaci* (Kuhn) Bast.

[Continued from page 314.]

E. T. EDWARDS, B.Sc.Agr., Assistant Biologist.

Parasitism of *Tylenchus dipsaci*.

The Infective Stage.—Accurate information concerning the infective stage of the stem nematode is not available, but most of the evidence suggests that normally infestation is initiated by one of the late larval forms. Godfrey (14) states in reference to the stem nematode disease of lucerne, that the initial infestation is brought about by the young larvæ, but gives no experimental evidence in support. Goodey (17) likewise considers that larvæ normally bring about infestation, but says there is not sufficient known about the life-history of the organism to say definitely which is the infective larval stage. Hodson (24) has had little success in inoculating seedlings with adult nemas, whilst larvæ under identical conditions have given a high percentage of positive results. Fox Wilson (10), however, reports having satisfactorily infested phlox plants by placing adult nemas in the leaf axils without previously injuring the tissues in any way. In dealing with biologic strains in a later paper, the same worker (11) states that greater success in cross infection work was obtained by the use of pre-adult larvæ

Under natural conditions, the two most important sources of infection are the nemas which migrate into the soil, and those which remain in the desiccated state in dead plant fragments. It is perhaps significant that the great majority of the nemas in these two groups are composed of late larval forms. Robertson (41) showed from his soil counts that over 90 per cent. of the nemas occurring in the soil were larval forms, and Goodey (18) has shown definitely that the pre-adult larvæ are the most resistant to desiccation.

Mode of Entry into Host Tissues.—*Tylenchus dipsaci* may readily gain access to tissues which have been injured by mechanical agencies, but in addition it is well known that the organism is capable of entering hosts which have not been injured in any way. It was formerly thought that the stylet or buccal spear was used to attack the plant and bring about mechanical penetration of the host cells, but it is now considered that the infective nema forces its way directly into the young succulent tissues and that the spear plays no mechanical part in this penetration. Direct penetration of the host tissues by the infective larvæ of a number of other parasitic nematodes is known to occur (*e.g.*, the human hookworm *Ancylostoma duodenale*).

Function of the Buccal Spear.—A detailed examination of the spear of *Tylenchus dipsaci* shows that it is a very slender, needle-like organ, about 12 to 15 microns in length. Although it is moved backwards and forwards

with great rapidity it has never been seen exserted from the buccal cavity, and Steiner ([45]) states that close examinations of the tissues of affected plants have failed to reveal any evidence of mechanical injury due to the stylet. Although the true function of the spear is at present not fully understood, many nematologists consider that it is used to pump a salivary secretion into the host tissues. The work of Cobb ([6]) on the salivary glands of *Tylenchus dipsaci* and other plant infesting species of *Tylenchus* is of interest in this connection. At the base of the neck in all cases he found three unicellular salivary glands which emptied forward through separate ducts. The significant feature is that one of the glands emptied at the base of the buccal spear, and the other two ducts emptied at the base of the valve of the first œsophageal bulb. Steiner ([45]) has put forward the suggestion that the various growth abnormalities which commonly result from nematode infestation are essentially plant reactions to these salivary secretions.

Biologic Specialisation.

As stated previously, *Tylenchus dipsaci* has a very wide host range, but within the species a number of distinct races of different parasitic capabilities are known to occur. The host range of the various strains varies considerably, being quite wide in some cases, and in others restricted to a small group or even to a single plant species.

Quanjer ([37]) in Holland found a remarkable polyphagous race occurring naturally on potatoes and certain pasture plants. Under experimental conditions this strain was found to be capable of infesting no less than fifty-two different kinds of plants, twenty-eight of which had not previously been recorded as hosts of *Tylenchus dipsaci*.

On the other hand, the literature contains a great deal of evidence of the occurrence of many clearly defined and highly specialised biologic races with very restricted host ranges. Ritzema Bos ([40]) in his original work on the biology of *Tylenchus dipsaci* drew attention to the different parasitic capabilities of the nemas infesting rye and onions, and, in addition, stated that nemas which had parasitised a certain host for a number of generations became adapted to that plant and showed a marked preference for it. Van Slogteren ([44]) in 1920 showed by careful infection experiments that distinct biologic strains of *T. dipsaci* occurred on narcissus and hyacinths in Holland. Byars ([4]) in 1920 reported *Tylenchus dipsaci* as a serious pest of strawberries and red clover in certain parts of America, yet frequently strawberries free from infestation were growing amongst badly diseased clover plants. Goodey ([17]) in 1922 worked with a strain from red clover, and found that lucerne, white clover and trefoil were non-susceptible, yet each of these plants is a known host of *Tylenchus dipsaci*. Ware ([47]) in 1925 showed that red clover was very resistant to the strain which he found infesting white clover (*Trifolium repens*). Hodson ([24]) in 1926 made a number of field observations and found that frequently known host plants of *Tylenchus dipsaci* had been grown in rotation year after year in heavily-infested soil

It was commonly found that the parasite restricted its attack to one host crop and that the crop grown in rotation, although it was a known potential host, remained free from infestation. This type of observation was made in the case of narcissus and strawberries, bulbs and oats, and oats and red clover, the first-named crop in each case being heavily infested, whilst the other showed no evidence of attack. Hodson ([24]) at the same time carried out a series of infection experiments, and obtained additional evidence of the occurrence of a number of distinct strains with a marked preference for particular host plants.

Steiner ([45]) has drawn together a great deal of the available information on the subject of biologic races in the plant-infesting nemas. He concludes that a given population of any species always prefers to attack the plant type upon which its ancestors lived, but if this is not available a closely-related host plant may be infested. The facility with which such infestation occurs is presumed to be dependent upon the host history of the preceding generations. If these were a polyphagous type with a wide host range, then the new generation is considered to be capable of infesting all the hosts of its ancestors. On the other hand, if the ancestral nemas were a specialised race with a narrow host range, then the parasitic capabilities of the new generation will be likewise restricted, and they will probably be incapable of infesting other potential host plants.

Recent work by Hodson ([26]), using fourteen distinct strains of *Tylenchus dipsaci*, has shown that whenever a particular strain is given access, without alternative, to a single potential host plant, other than the one from which it was derived, the nemas invariably failed to become established, although in all cases infestation of the original host could readily be obtained. It is thus seen that failure to infest the potential host is apparently solely due to the innate inability of the nemas to become established in the tissues of the new host. Certain strains appeared to be more adaptable than others, insofar as they actually entered the tissues of the potential host, but were unable to persist and reproduce themselves.

It is apparent that definite biologic strains of *Tylenchus dipsaci* are of common occurrence. These strains are perhaps best regarded as adaptations to a particular host range, the degree of specialisation increasing according to the length of time the strain has infested the one host plant. Goodey ([22]) has recently pointed out that this gradual adaptation and ultimate specialisation of the nemas to a particular host range does not necessarily involve the inheritance of acquired characteristics. He postulates the existence of a food memory complex together with a physiological specialisation of the sense organs whereby the nema locates its preferred host plant. He further states that such a food memory factor may quite well be situated in the somatic tissues of the offspring, and thus does not necessarily involve any modification or alteration of the germ plasm.

In addition to the purely scientific aspect, the occurrence of biologic strains in *Tylenchus dipsaci* and other plant-infesting nematodes has a very important

practical aspect. In all infection experiments it is essential to know the host history of the strain for at least a number of generations, and it is of considerable importance to know accurately the host range of a strain infesting any particular crop, before recommending any system of crop rotation for the control of the parasite.

Spread of the Disease.

There are three main sources from which infection with *Tylenchus dipsaci* may arise :—

(1) The nemas which migrate from the host tissues into the soil.

(2) The quiescent nemas which remain in the dried tissues of affected plants.

(3) Nemas which are seed-borne.

In addition the possibility of the disease being spread by the passage of infective nemas through the digestive tracts of animals should not be overlooked.

As stated previously, large numbers of *Tylenchus dipsaci* are known to leave the host tissues and migrate into the soil. These nemas are unable to become quiescent whilst in a moist environment, and move round in the soil until a fresh host plant is located. Under field conditions, and particularly with a thickly sown crop like lucerne, these nemas undoubtedly constitute one of the principal sources of infection. According to Fox-Wilson (11) *Tylenchus dipsaci* spreads very rapidly in damp, loamy soil, owing to the ease with which the nemas can move in the watery medium between the soil particles, but in light sandy soils progress is much more difficult, and consequently the spread of infection is comparatively slow. On the other hand, many nematodes do not escape into the soil, but remain in the diseased tissues, and as these dry out the nemas become quiescent; they are capable of remaining in this dormant condition for long periods without loss of infective capabilities. Fragments of affected tissues containing quiescent nemas can be transported long distances by natural agencies such as wind, and irrigation and flood waters. Infective nemas may also be distributed mechanically by the transportation of affected lucerne hay, and by means of farm implements or any other agency capable of transferring plant fragments.

In the Hunter River districts of New South Wales, flood waters are probably the most important means of spreading the parasite to new lucerne areas. Many farmers claim that the first evidence of the stem nematode disease in their crops, was observed after inundation with flood waters. Where lucerne is grown under irrigation, water is again one of the principal means by which the parasite is spread. Godfrey (16) has recently estimated that as many as 400 nemas per gallon occur in irrigation water on areas infested with *Tylenchus dipsaci.*

Seed Dissemination.—The possibility of seed dissemination of *Tylenchus dipsaci* has been recognised for many years. In 1909 Lounsbury (32) stated

that in South Africa, circumstantial evidence strongly suggested that the parasite was disseminated with lucerne seed, although microscopic examination of many seeds had failed to reveal any trace of nematodes. Godfrey ([15]) showed that the stem nematode was carried internally in the seeds of the true dandelion (*Taraxacum officinale*) and the false dandelion (*Hypochœris radicata*). Further, seed dissemination was found to be the most important means of spreading this parasite amongst these two hosts over a wide area. Hodson ([24]) found that occasionally the quiescent larvæ of *Tylenchus dipsaci* were present beneath the pales of oat seed harvested from heavily infested areas. Robertson ([41]) showed clearly that the parasite commonly infests the grain produced on badly affected oat plants. Hodson ([25]) found that seed dissemination of this nematode was of common occurrence on *Hypochœris radicata* and *Plantago* spp. in the south-west of England.

Cobb ([7]) called attention to the presence of *Tylenchus dipsaci* on lucerne seed imported into the United States from South Africa. The presence of the nematode on red clover seed is also well known. Cobb ([9]) reported that clover seed harvested from an infested field in Idaho was carrying over 900 nematodes per lb. of seed, and about 90 per cent. of these were found to be *Tylenchus dipsaci.* It is of interest to note that the nematode is not carried internally in the seed of lucerne and red clover, but in each case the organism in the quiescent condition is found adhering very tenaciously to the seed coat. Cobb ([7]) reports that in some cases samples of red clover seed which had been continuously soaked and washed daily, continued to yield nemas up to the seventh day. In other cases no nematodes were obtained in the washings for the first three days, but in later washings nemas were found to occur.

Transmission through Animals.—Comparatively little work seems to have been done on this phase of the dissemination of plant-infesting nematodes. The available data, however, generally indicates that the nemas are not viable after passage through the alimentary tracts of animals.

Leaflet No. 271 of the Board of Agriculture and Fisheries (1913) London, which deals with the stem nematode disease of clover, states that the droppings of sheep fed on infested clover frequently contain nemas and eggs which have not been injured by passage through the alimentary canal. However, no experimental evidence is given to support this statement. Sandground ([42]) reported that the eggs of *Caconema radicicola* appeared uninjured after passage through the human alimentary canal. Leukel ([31]) conducted feeding experiments with the galls of *Tylenchus tritici*, and found that the nemas failed to survive passage through the alimentary tract of horses, cows, pigs, sheep, and chickens. Marcinowski ([33]) likewise fed galls of *Tylenchus tritici* to various birds and animals, and found live larvæ in the excreta of certain birds. Infection experiments with the excreta gave positive results, but she concluded that birds are only a minor factor in the dissemination of this nematode. Triffitt ([46]) conducted feeding

experiments with the sugar beet nematode *Heterodera schachtii*, and found that the larvæ and eggs were not viable after passage through young pigs. Fox-Wilson ([11]) fed young rabbits on phlox shoots heavily infested with *Tylenchus dipsaci*, but was unable to find living nemas or viable eggs in the fæces. Infection experiments likewise indicated that this organism is unable to survive passage through the alimentary tract of the rabbit.

General Control Measures.

Once the stem nematode becomes established it is an extremely difficult parasite to bring under control, so that the prevention of the disease is of primary importance. Prevention essentially depends upon the sowing of clean seed in non-infested soil, together with the adoption of precautionary measures to prevent the introduction of the nema from infested areas. Under field conditions control depends entirely upon the eradication of affected plants and the growth of non-susceptible crops for a number of years in order to starve the organism out of the soil.

Clean Seed.—No success has been achieved with the chemical treatment of nematode-infested seed or other plant parts commonly used in propagation. Ramsbottom ([38]) immersed narcissus bulbs infested with *Tylenchus dipsaci* in nineteen different chemical solutions of varying concentrations, for varying periods, but was unable to kill the nematodes effectively. Fumigation with a number of poisonous gases, including hydrocyanic acid, formalin, toluol, nicotine, carbon bisulphide, and napthalene, even for periods ranging up to seven days likewise failed to destroy the nemas in the bulbs. More recently Cobb ([8]) has again drawn attention to the ineffectiveness of hydrocyanic acid gas for the destruction of *Tylenchus dipsaci* in narcissus bulbs. He found that a fumigation sufficient to kill all the insects present, failed to kill the nemas and even a second fumigation of this nature was also ineffective. Continuing his investigations Ramsbottom ([38]) found that soaking the bulbs for two to four hours in water held at a temperature of 110 deg. Fahr. satisfactorily killed the nematodes with minimum injury to the bulbs. Cobb ([9]) found that when red clover seed infested with *Tylenchus dipsaci* was soaked in water at a temperature of 118 deg. Fahr. for fifteen minutes, all the nemas were killed. The germination capacity of the seed was not impaired in any way, but was improved if the seed was sown as soon as it was dry enough to be handled.

Experiments carried out by the writer have shown that lucerne seed can likewise be subjected to treatment with hot water without any deleterious effect upon subsequent germination. Four lots of seed were treated with hot water for periods of fifteen minutes each, the temperatures ranging from 116 deg. Fahr. up to a maximum of 129 deg. Fahr., which is 11 deg. higher than the temperature necessary to kill the nematodes. After treatment the seed was allowed to dry thoroughly on sheets of blotting paper, and at the end of four hours when drying was completed a germination test with portion of the seed was commenced. A week after treatment a second

test was commenced with the remainder of the seed. The tests were carried out in flat, oblong, enamel dishes, containing a strip of sterilised flannel covered with a double thickness of blotting paper and saturated with water. Two hundred seeds of each lot were placed in each of the trays, which were then covered over with sheets of glass and placed in an incubator at 30 deg. C. Germination counts were made at the end of three days, and then at regular intervals for a period of three weeks. The results, which are set out hereunder in tabular form, show clearly that treatment with hot water at temperatures sufficiently high to kill *Tylenchus dipsaci*, has no deleterious effect on the germination of lucerne seed.

TABLE I.—GERMINATION Test commenced Four Hours after Treatment.

Treatment.	Temperature range.	Percentage germination at end of three days.	Percentage germination at end of three weeks.
	Deg. Fahr.	Per cent.	Per cent.
Untreated	......	63·5	79·5
Immersed in hot water for fifteen minutes.	116–118	64·5	77·0
	118–120	75·5	87·5
	124–126	74·0	82·0
	126–129	72·0	79·0

TABLE II.—GERMINATION Test commenced One Week after Treatment.

Treatment.	Temperature range.	Percentage germination at end of three days.	Percentage germination at end of three weeks.
	Deg. Fahr.	Per cent.	Per cent.
Untreated	......	61·0	72·5
Immersed in hot water for fifteen minutes.	116–118	69·0	82·0
	118–120	69·0	84·0
	124–126	72·0	83·5
	126–129	63·0	79·0

Ramsbottom (38) and Cobb (9) have shown that temperatures of 118 to 120 deg. Fahr. for fifteen minutes effectively kill *Tylenchus dipsaci*, and it has been found that lucerne seed is capable of withstanding higher temperatures, ranging up to 129 deg. Fahr. without any loss of viability. The margin of safety is therefore sufficiently wide to enable this hot water treatment to be satisfactorily carried out under ordinary farm conditions. Moreover, seed treated a few days prior to sowing does not suffer any loss of viability. The seed used in the experiment had been dressed but not recleaned, and contained a fairly large number of "hard seeds" which frequently failed to germinate in the untreated samples, but which germinated considerably

better after treatment. The results indicate generally a slight stimulation in the rate of germination, and also an increase in the final figures for the treated samples. It is considered that this improvement in germination is due to the softening effect of the hot water on the seed coat.

Clean Soil.—The use of chemicals as soil fumigants and drenches is of little value in nematode control, as apart from their general ineffectiveness, the cost of treatment on a commercial scale is generally prohibitive. Most of the soil treatment work has been concerned with the control of the root knot nematode, *Caconema radicicola*, and a great variety of substances have been tried by various workers, but with little success. Satisfactory results have been reported from Florida and California by the application of 500 to 700 lb. of calcium cyanide per acre, but a number of other workers have been unable to obtain similar results. Under English conditions Hodson and Gibson ([27]) found that treatment with calcium cyanide was quite ineffective, even when the rate of application was increased to 2,000 lb. per acre. The same authors ([27]) also found that applications of up to 1,400 lb. of calcium cyanide per acre failed to bring about any appreciable reduction in the nematode population of soils infested with *Tylenchus dipsaci.*

Ramsbottom ([39]) attempted to rid infested soil of *Tylenchus dipsaci* by the application of various chemicals, including gas lime, calcium carbide, naphthalene, carbon bisulphide, toluol, formaldehyde, ammonia, and several proprietary compounds, but found in all cases that the treatments were valueless. It is thus seen that under field conditions the eradication of *Tylenchus dipsaci* from infested soil must necessarily depend upon the eradication of susceptible crops and the adoption of a suitable system of crop rotation, so that only non-susceptible crops are grown on the area for a number of years.

Resistant Plants.—It has often been suggested that the application of fertilisers, particularly potassic compounds, is beneficial, and aids susceptible plants to resist nematode infestation. Ramsbottom ([39]) carried out a series of manurial experiments on soil infested with *Tylenchus dipsaci*, using sulphate of iron, sulphate of potash, and various mixtures containing the latter compound, together with sulphate of ammonia, superphosphate and bonemeal. His results showed clearly that applications of these fertilisers were quite ineffective in preventing nematode infestation of narcissus. So far no success has been achieved in the breeding of resistant varieties, but owing to the occurrence of biologic strains it is possible to grow known host plants of *Tylenchus dipsaci* in infested soil, and obtain crops free from stem nematode disease. However, before this can be done it is essential to possess a detailed knowledge of the host range of the particular strain of *Tylenchus dipsaci* occurring in the field.

Control of Stem Nematode Disease of Lucerne.

Every effort should be made to prevent the introduction of the stem nematode into new areas. Lucerne seed obtained from diseased fields should be immersed for fifteen minutes in warm water held at a temperature of

118 to 120 deg. Fahr. After treatment the seed should be spread out thinly and allowed to dry thoroughly before being placed in clean bags. It is preferable to sow lucerne seed within a few days after treatment. Lucerne hay should always be fed to livestock in feeding troughs, and should not be scattered about the ground, as infected hay contains large numbers of nematodes, which are readily disseminated in this way. Moreover, stock should not be allowed to graze on infected areas, as the infective nemas are easily distributed in soil and plant fragments which adhere to the feet and bodies of farm animals.

Once the stem nematode disease has become established the control measures depend entirely upon the complete destruction of affected plant parts and crop rotation. Affected crops should be cut in the ordinary way, and the lucerne allowed to dry out on the ground where it falls. Badly diseased crops invariably contain a good deal of grass and weed growth, which dries out fairly rapidly. As soon as the cut has dried sufficiently a fire should be run over the field and the whole crop burned *in situ*. The land should then be ploughed as deeply as possible and harrowed. As far as practicable all the old crowns and other remaining plant parts should be raked up or collected in some way and burned separately. Particular attention should be given to lucerne, clover, and trefoil growing along the headlands, as these plants may be capable of sustaining the nematode, and, if not destroyed, will serve as sources of infection when the field is eventually replanted with lucerne.

After breaking up the stand, the field should be cultivated frequently in order to keep down the growth of weeds, grasses, and "volunteer" lucerne plants, which are capable of harbouring the parasite. It must be realised that the success of control by this method is essentially dependent upon the thoroughness with which susceptible plants are removed from the field.

As soon as the old lucerne field has been brought to a suitable state of tilth, crops which are not susceptible to the stem nematode can be sown on the area. Non-susceptible crops should be grown for at least three to four years before resowing with lucerne. Under New South Wales conditions it is quite safe to replace lucerne with crops such as potatoes, maize, oats, or other cereal crops.

Farm implements used in the cultivation of infested land or implements used in the process of eradicating diseased lucerne should be thoroughly cleaned and disinfected before being used in other fields. Disinfection can readily be carried out by the application of boiling water, or by momentarily flaming the implements with a torch.

Summary.

The stem nematode *Tylenchus dipsaci* (Kuhn) Bast., is world-wide in its distribution, and is a serious parasite of many agricultural crops. Under New South Wales conditions it causes a serious disease of lucerne, and is now widely spread throughout the lucerne-growing areas.

The symptoms of the disease have been described, and a list is given of the host plants thus far recorded in New South Wales.

A comprehensive review of the available literature has been made, and a description of the organism *Tylenchus dipsaci* (Kuhn) Bast. is given, together with the known data concerning the development, life-history, parasitism, biologic specialisation, dissemination and control of the organism. In addition certain specific measures are recommended for the control of the stem nematode disease of lucerne under New South Wales conditions.

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NEW ZEALAND MODIFIES EMBARGO ON OUR GRASS SEED.

IN last month's *Agricultural Gazette* readers were advised that New Zealand had stopped the importation from New South Wales of paspalum and other grass seed for sowing. That embargo has now been modified, and grass seed grown south of the route from Port Macquarie to Uralla or west of the railway line from Uralla to the Queensland border will be accepted, provided it is supported by declaration and certificate and has been fumigated before shipment. It is understood that it will be again fumigated in New Zealand.

FINAL FORECAST OF THE 1932–33 CITRUS CROP.

IN his final forecast of the New South Wales citrus crop for 1932-33, Mr. A. A. Watson, Director of Marketing, sets down the prospective yields as follows:—Navel oranges, 754,000 bushels; Valencia oranges, 1,163,000 bushels; common and other oranges, 490,000 bushels; mandarins, 500,000 bushels; lemons, 370,000 bushels, making a grand total of 3,277,000 bushels.

Lucerne on Monaro Sheep Country.

L. W. McLENNAN, B.Sc.Agr., Assistant Agrostologist, and JOHN L. GREEN, H.D.A., Agricultural Instructor.

ALTHOUGH some of the most extensive areas under lucerne on individual farms are to be found on grazing properties on the Monaro, it is remarkable that so comparatively few graziers in that section of the State have had the wisdom to follow the lead of their more progressive neighbours.

Lucerne is of particular value in providing succulent feed for lambing ewes and for fattening stock for market, also for supplementing the sparse pasture growth during the severe winters experienced on the Monaro. Lucerne hay, taken off the areas established on the richer flats, provides valuable fodder reserves, which enable stock to be kept in condition at all times and also make it possible for the paddocks to be stocked to capacity year in and year out. By employing this system of grazing and conserving lucerne, Monaro hill country will carry up to three sheep to the acre—more than double the carrying capacity of the natural pastures.

A Large Area on "Dromore" Station, Chakola.

One of the largest areas of lucerne on any one holding in New South Wales is the total of 2,500 acres on the flats of the Murrumbidgee River on Dromore Station, Chakola, 12 miles north of Cooma. Although the area is treated primarily for hay, it also provides heavy grazing, and good management ensures a lengthy life for the crop. Two cuts a year are usually obtained, yielding about 1,800 tons of hay, most of which is utilised on other stations belonging to the proprietors. New areas are sown almost every year, while worn-out stands are promptly re-sown.

Spring Sowing Favoured on Rich Flats.

The manager of "Dromore" (Mr. Rostron) has found autumn ploughing followed by spring sowing the most successful means of establishing lucerne. By adopting this practice the young lucerne escapes the winter weeds, of which wild turnip and "fat hen" are by far the worst. New ground is ploughed to a depth of 4 or 5 inches, whilst in old lucerne paddocks intended for re-sowing it is found necessary to go to a depth of 8 inches.

Experiments during recent years have shown that on this particular class of soil, sowing at the rate of 11 lb. per acre is desirable. In sowing 575 acres of lucerne Mr. Rostron used amounts of seed ranging from 7 to 11 lb. per acre. Yields from each of the plots were weighed accurately, and it was found that the 11 lb. stand yielded best. Superphosphate applied

with the seed encouraged too much top growth at first, but when used with established stands it caused considerable increase in growth.

It has been found that the method of management of a lucerne stand largely determines the length of time that it will grow satisfactorily, except where there is a clay subsoil within about 3 feet of the surface, when lucerne will tend to die out in from three to five years, in spite of all care. On the other hand, there are healthy stands at "Dromore" which have been growing well for forty-five years.

The cultivation of the lucerne in July or August is always beneficial in this district, and superphosphate applied at the the same time has given good results.

Quick Grazing Desirable.

When inspected in August, 1931, a 70-acre paddock that had been cultivated and top-dressed with ½ cwt. superphosphate per acre in autumn 1929 had been carrying two and a half sheep per acre, for three months, whilst a strictly comparable 30-acre untreated paddock, stocked at one sheep per acre, was eaten out in five weeks.

The manner in which the lucerne is grazed is the most important factor affecting its permanence. It is known that a lucerne crop that is always mowed for hay will recover more quickly after cutting and will last a greater number of years than one that is grazed. From this it may be assumed that quick grazing which resembles cutting is very desirable. Mr. Rostron grazes lucerne when it is about a foot high, and finds that twenty sheep to the acre will eat it down in five or six days. If the lucerne is allowed to approach maturity before being grazed, sheep will leave a large number of stalks, which should be mowed immediately the stock are removed.

Grazing lucerne one year and cutting the same area for hay the following season overcomes the injury which might occur during grazing. Immediately after cutting, the sheep are put into the paddocks for a couple of days to clean up the stray stalks of lucerne that have been left on the ground. In this way from 700 to 1,000 lambs are fattened each year.

Mr. Rostron recommends cutting and feeding lucerne to lambs for fattening. The crop is cut one day and fed the next. More lambs can be fed in this way than could be grazed on an equivalent area, and the danger of deaths from bloat is overcome. From 1927 to 1931 the average loss from bloat has been 7 per cent., which is very considerable, but it has not been possible to devise means to avoid the mortality. In some cases sheep have been grazed on lucerne for months, and then suddenly there have been very heavy losses, particularly when windy weather has followed showers.

There is no purely grazing lucerne at "Dromore," but Mr. Rostron is convinced that the undulating country would grow good stands if sown at the rate of 3 or 4 lb. per acre. He intends to commence this work as soon as possible.

The success of lucerne during the last five years is of particular significance when the following rainfall figures are considered :—

1927. ... 1,545 points in fifty-six falls of which four were greater than 1 inch and none greater than 120 points.
1928 ... 1,554 points in thirty-eight falls, two greater than 1 inch, maximum 120 points.
1929 ... 1,758 points in forty-six falls, three greater than 1 inch.
1930 ... 1,584 points in fifty-four falls, two greater than 1 inch.
1931 ... 723 points up till end of July.

Success with Top-dressing.

Top-dressing lucerne with superphosphate has been successful in spite of unfavourable seasons. Applications of ½ cwt. and 1 cwt. have been used, and although the extra ½ cwt. did not make an appreciable difference, it is very probable that shortage of moisture acted as a limiting factor, preventing full absorption of the fertiliser.

Using a 10-feet distributor Mr. Rostron top-dressed 392 acres of lucerne in 1928 with ½ cwt. of superphosphate per acre, and in 1929 an area of 124 acres with ½ cwt. and 80 acres with 1 cwt. superphosphate per acre. Although the season was very dry the lucerne responded well, and where cut for hay, yielded an additional ton per acre for the year following top-dressing.

Success with Lucerne on "Bobundara," Cooma.

"Bobundara" station, 20 miles south-west of Cooma has an altitude of 2,400 feet and an 18-inch rainfall. The soil, which ranges from dark red to heavy black basalt, is exceptionally fertile. This country stands very heavy grazing, the greatest number of stock carried on "Bobundara" for one year being 24,000 sheep, 1,000 head of cattle and 500 horses, on 16,000 acres in 1920.

The Manager, Mr. Mawson, has established 1,300 acres of lucerne which is grazed or cut for hay according to the season. Both hills and flats yield three cuts in normal seasons. Hill lucerne will carry at least three sheep per acre throughout the year if part of it is cut in the summer and hand fed to the sheep for two months in the winter when growth is very slow. The paddocks, ranging in size from 30 to 90 acres, are small enough to permit rapid feeding off when grazed. August sowing is favoured on the volcanic soil to avoid the abundant winter growth of barley grass.

Superphosphate was applied to lucerne and grassland in 1927 with very satisfactory results.

Mr. Mawson, like other graziers in the Cooma district who have have snow leases in the Kosciusko-Kiandra area, prefers early lambs so that they can be moved to these leases for three or four months in the summer. Two sheep per acre do well on the snow leases, and more where the leases are fenced. The lucerne areas are of particular value in providing succulent feed for ewes during this early lambing.

Many Years' Experience at "Murranumbla," Dalgety.

"Murranumbla" on the Snowy River, midway between Nimmitabel and Mount Kosciusko is 2,500 feet above sea level and has a 19-inch average annual rainfall. The soil is entirely of granite origin, growing mostly spear grasses and wallaby grass with a little clover on the flats.

Mr. Morrice, owner of the property, has grown grazing lucerne for many years with outstanding success, though few graziers in the district have profited by his example. More recent work with subterranean clover indicates that this plant is also eminently suited to the district and should be of outstanding value as autumn, winter, and spring feed.

Lucerne was first sown on "Murranumbla" forty years ago, and although this was ploughed and resown ten years ago many of the original lucerne plants, with their characteristic strong healthy crowns, still survive.

The lucerne sown includes:—

Five acres first sown forty years ago and re-sown in 1921 at 10 lb. per acre. This area yields heavy cuts of hay. A sandy strip along a creek on one side always grows much more quickly after rain, than does the remainder of the paddock.

Fifteen acres first sown forty years ago and re-sown with drill in 1923 at 8 lb. per acre. A very good stand.

Ten acres broadcasted at 15 lb. per acre in 1921. There was a poor germination but the area developed into a fair stand. It improved considerably after renovation, and top-dressing with ¾ cwt. superphosphate in 1930. Like other paddocks which had been spelled for two or three weeks the lucerne showed a green shoot 2 to 4 inches long when inspected in July, 1931. Winter growth is seldom as vigorous as this, although light grazing is usually possible.

Ten acres broadcasted with 15 lb. oats per acre in the spring of 1921. In 1928 part of this paddock was renovated and showed a remarkable increase in growth over the untreated section. This paddock has averaged two cuts per annum since sowing.

Four acres sown in the autumn of 1924, at 8 lb. per acre. This has always carried three sheep per acre. Barley grass, which is usually thick in this paddock in the winter, is a useful supplement to the lucerne.

Seventy acres sown in autumn 1927 at 8 lb. per acre, and 20 acres sown in spring 1929 at 8 lb. per acre. These areas are included in the same paddock (90 acres) and carried two and a half sheep per acre continuously from 1st August, 1930, to 1st August, 1931.

Autumn Sowing Favoured on Granite Country.

Mr. Morrice favours autumn sowing and uses 6 to 8 lb. of seed per acre where the lucerne is to be cut for hay, but realises that about half of this quantity would be sufficient where the lucerne is required solely for grazing.

The land is ploughed, cultivated and harrowed several times to prepare a fine firm seed bed and rolled after a shallow sowing. Using these methods a reliable germination is assured; this is most important because a thin lucerne stand will not thicken up by seeding.

Cultivation of the lucerne in August or September and the application of ¾ cwt. superphosphate per acre have very considerably increased the growth, particularly on old stands which were thinning out. Most of the lucerne paddocks were renovated in this way in 1930 and the improvement was noticeable more than a year later.

The best lucerne paddocks, which are creek flats, yield two cuts in average seasons as well as being heavily grazed. The first cut in November, averages 15 cwt. per acre, and the second in January or February averages 17 cwt. No losses occur from bloat, which is most probably due to the fact that sheep have access to grass when grazing the lucerne.

Subterranean Clover Carries Three Sheep Per Acre.

The very successful growth of 30 acres of Subterranean clover sown in April, 1929, indicates that this clover should be as valuable for winter feed in this district as it is in so many other other districts on the Southern Tablelands.

The area was ploughed and the clover drilled in at 2 lb. per acre with ¾ cwt. superphosphate. It seeded well the first year and there was a good germination in April, 1930. In July, 1931, a dense mass of clover 2 to 4 inches high covered the ground and had choked out most of the tussocky poa and wire grass which formerly predominated in the paddock. Three sheep to the acre had been carried for the year, whilst natural pastures carried only one.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Trangle (F. H. Hayles) ...	... May 10, 11	Bogan Gate (J. a'Beckett)	... Aug. 24
Cootamundra Sheep Show (G. B. Black)	... July 20, 21	Parkes (L. S. Seaborn) ...	... „ 30, 31
Tullamore (S. D. Cameron)	... „ 27	Forbes (E. A. Austen) ...	... Sept. 6, 7
Peak Hill (W. R. L. Crush)	... Aug. 2, 3	Berrigan (R. Wardrop) ...	... „ 28
Trundle (D. Leighton) ...	... „ 9, 10	Narrandera (J. D. Newth)	... Oct. 4, 5
Condobolin (J. M. Cooney)	... „ 16, 17	Griffith (M. E. Sellin) ...	... „ 18, 19
		Cootamundra (G. B. Black)	... „ 25, 26

Recently-issued Empire Marketing Board Reports.

Copies of the following reports have been received from the Empire Marketing Board, London:—

"Report on the Organisation of Potato Marketing."

"Dairy Research: A Report to the Empire Marketing Board by Sir William Dampier."

Wheat and Oat Trials, 1931.

FARMERS' EXPERIMENT PLOTS.

(Continued from page 288.)

The Riverina District.

G. C. BARTLETT, H.D.A., Senior Agricultural Instructor.

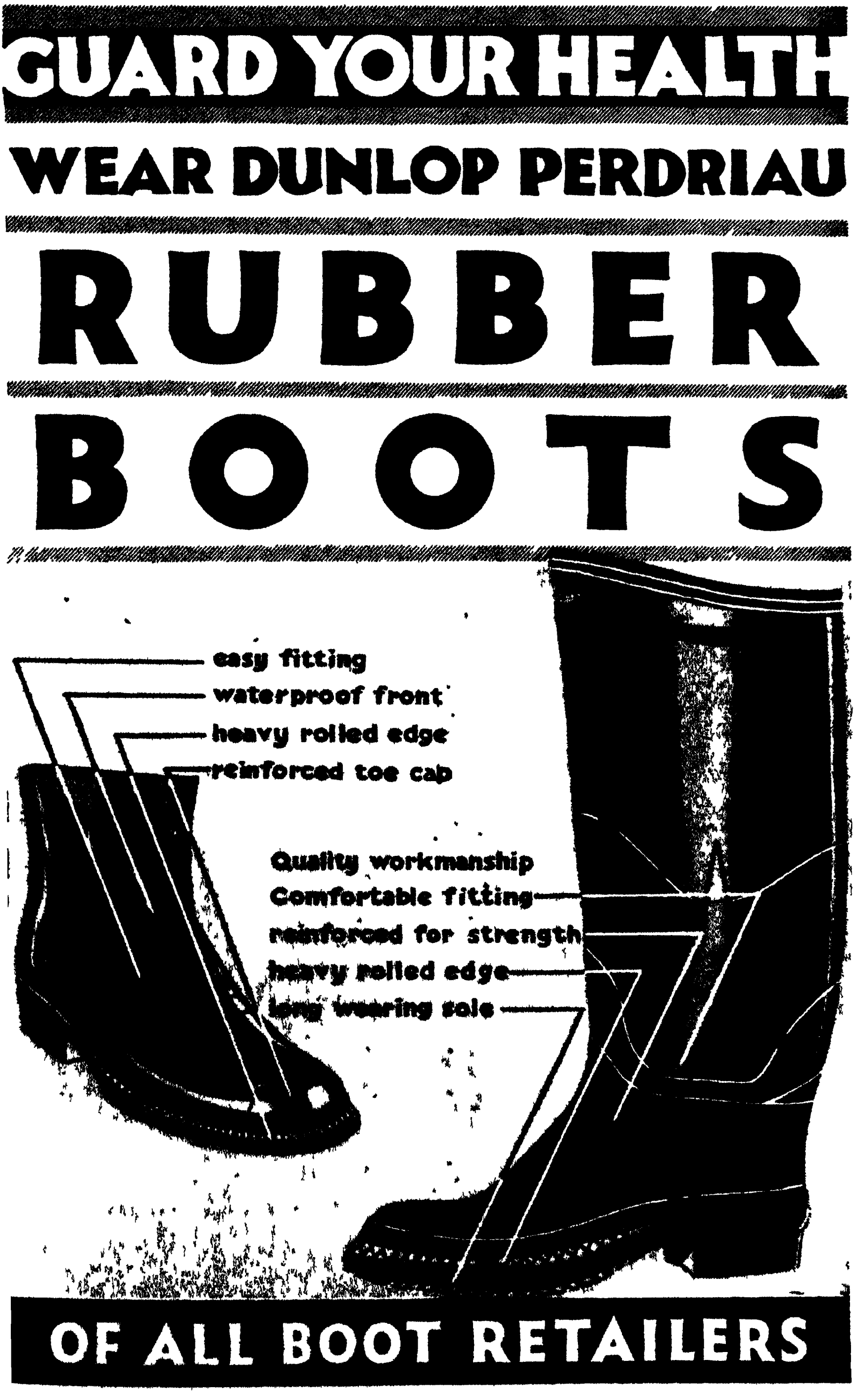
FARMERS in numerous centres in the Riverina co-operated with the Department in carrying out wheat variety, fertiliser and rate of seeding trials, as well as oat variety and fertiliser trials. An oat grazing trial was sown at Uranquinty, but it was too wet to feed it off. The unusually wet conditions actually precluded sowing altogether at some centres, while at others the plots were so damaged by rain as to be useless for purposes of comparison.

Rain Does Considerable Damage.

Following abnormally dry conditions during 1930 the weather broke in early December, when from 6 to 10 inches of rain fell over the whole district. The dry season was favourable to the eastern districts but disastrous in the west. The December rains soaked the fallows and started a prolific growth of weeds, which, during the ensuing months, was most difficult to destroy. In some cases fallows had to be reploughed or disced, while some fallows were not sown at all. Except for a few fine spells in April the season remained wet from March till the end of July.

The most favoured month for seeding (May) in the Riverina was so wet that seeding had to be almost suspended. In some cases the late sowing of the early maturing wheats had to be postponed until too late for good results. Many plots were practically under water for two or three weeks, others had streams running across them, which destroyed bands and large patches up to 3 chains across, and in one or two cases the plots could not be sown at all. The land remained saturated and practically water-logged from April till August. Under the influence of the dry warm spring conditions the land rapidly set very hard.

Growth was poor and patchy, weed growth was very troublesome and the stooling was very poor, even in the April-sown plots. All the plots throughout the district suffered from water damage or soakage and in some cases the damage was so extensive as to render comparisons impossible. In the eastern districts it was the wettest season experienced for seventy years.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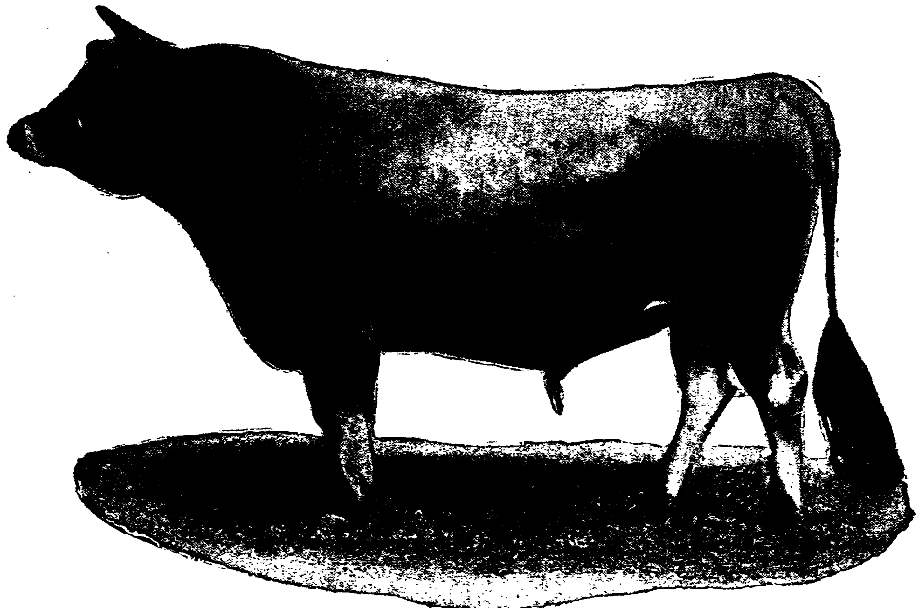


FINVOY GOLDEN NOBLE (imp. N.Z. Vol. 15)
[Stationed at Hawkesbury Agricultural College]

DEPARTMENTAL herds include the following stud bulls:—Guernsey: Hopeful of Wollongbar (499), Champion, R. A. Show, Sydney, 1928. Ayrshire: Scottish Pride of Gowrie Park (3797), First and Champion, R. A. Show, Sydney, 1927. First and Reserve Champion, R. A. Show, Sydney, 1928. Milking Shorthorn: Morning Star of Darbalara (Vol. 8), Second R. A. Show Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522·5 lb. milk; 1,614·1 lb. butter fat in 365 days. Jersey: Finvoy Golden Noble (imp. N.Z., Vol. 15).

Young bulls available for sale from tested Dams of the following breeds:—

MILKING SHORTHORN. JERSEY. GUERNSEY. AYRSHIRE.

Application should be made to—The UNDER SECRETARY, Department of Agriculture, Sydney.

The following table shows the rainfall on the fallow and on the crop from July, 1930, to November, 1931.

RAINFALL Table, 1930–31.

	Jindera.	Albury.	Corowa.	Holbrook.	Tumbarumba.	Wagga.	Henty.	Bidgeemia.	Milbrulong.	Berrigan.	Finley.	Jerilderie.	Deniliquin.	Ganmain.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
	Rainfall on the Fallow.													
1930.														
July	222	234	139	246	328	126	194	148	144	117	121	118	102	...
August	384	383	267	366	490	324	371	160	264	166	172	201	127	...
September	99	117	74	51	210	100	63	30	70	34	32	24	57	...
October	440	400	297	416	583	375	460	262	348	292	313	268	165	...
November	179	166	223	182	259	100	172	130	150	87	99	91	66	...
December	864	797	778	702	725	825	531	606	424	976	811	848	661	...
1931.														
January	80	136	76	123	307	174	78	45	41	28	2	62	39	66
February	80	102	35	142	127	93	136	76	76	34	20	39	11	50
March	621	632	455	846	716	520	663	306	306	240	335	343	196	486
Total on Fallow ...	2,969	2,967	2,344	3,074	3,745	2,637	2,668	1,763	1,823	1,974	1,905	1,994	1,424	...
	Rainfall on the Crop.													
April	285	292	247	371	278	234	302	337	237	254	227	257	248	178
May	589	621	546	447	682	609	600	488	488	411	456	414	384	521
June	809	833	654	895	1,228	740	998	735	735	454	467	474	409	584
July	232	238	207	265	300	152	199	134	138	104	118	104	108	96
August	235	358	183	227	396	107	164	100	106	91	131	48	72	95
September	180	171	116	178	234	203	179	214	212	106	134	111	171	181
October	156	179	161	138	174	41	107	94	91	142	176	118	129	64
November	205	376	217	230	392	118	275	280	282	163	283	275	80	151
Total on Crop ...	2,691	3,068	2,331	2,751	3,684	2,204	2,824	2,382	2,289	1,725	1,992	1,801	1,551	1,815

The Wheat Variety Trials.

The unusual weather conditions adversely affected yields in the wheat variety trials, some of the standard varieties for the district practically failing, while unavoidable late sowing of the early varieties also resulted in poor yields.

The cultural details and yields of these trials are given in the table on pages 364 and 365.

Wheat Rate of Seeding Trial.

The relative merits of seedings of 65 and 80 lb. seed per acre were tried out on Mr. T. Rodham's farm at Uranquinty. Yandilla King was the variety used, and the soil on which the trial was conducted is a red granite loam. For cultural details see the table giving results of wheat variety trials. The heavier rate of seeding yielded 18 bushels 1 lb. per acre as compared with 16 bushels from the other rate.

Fertiliser Trials with Wheat.

The yields in the fertiliser trials are given on page 367. The cultural details are the same as in the wheat variety trials.

CULTURAL Details and Yields

District	Gerogery.	Jindera.	Balldale.	Holbrook.	Tumbarumba.	Uranquinty.	Henty.	Munyabla.
Experimenter ...	C. W. Moll.	G. Nation.	G. Howard.	G. Perry.	T. McAuliffe.	T. Rodham.	R. Nottle.	C. Campbell
Nature of soil ...	Red granite loam.	Brown loam	Red loam.	Brown loam	Red volcanic loam.	Red granite loam.	Brown loam	Brown loam
Ploughing ...	Mouldboard 5 in. July.	Mouldboard 4½ in. August.	Mouldboard 4 in. August.	Sundercut 4 in. July.	Mouldboard 4 in. October.	Mouldboard 4½ in. July.	Mouldboard 4½ in. August.	Mouldboard 4½ in. August.
Cultivation ...	Harrowed August, scarified October, February and March.	Harrowed September, scarified October and February, disced March, scarified April.	Harrowed September, scarified February and April.	Disced February, spring-toothed March.	Harrowed December, spring-toothed twice in March, again April.	Harrowed September, spring-toothed October, February and May.	Spring-toothed October, scarified February, skim ploughed and harrowed May.	Scarified October and March.
Date of sowing ...	Bobin and Waratah sown 20th May, remainder on 22nd April.	Bobin and Waratah sown 21st May, remainder 28th April.	21st May.	Bobin and Waratah sown 22nd May, remainder 6th May.	12th April.	Bobin and Waratah sown 8th July, remainder 6th May.	19th May.	21st May.
Seed per acre lb.	70	66	60	64	65	65	75	75
Superphosphate per acre lb.	90	90	80	83	90	90	75	110
How sown ...	Combined.	Combined.	Combined.	Combined and harrowed.	Hoe drilled.	Combined.	Hoe drilled.	Combined, scarified after sowing.
Remarks... ...	......	......	......	......	......	......	......	......
Varieties.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Yandilla King ...	11·4	11·3	13·2	12·5	......	16·0	17·9	Failed.
Marshall's No. 3...	12·2	10·7	11·6	12·0	......	......	......	23·5
Baringa	16·3	5·1	......	......	......	......	......	30·2
Turvey	......	......	14·7	......	......	18·5	......	......
Penny	......	......	17·2	......	......	......	......	......
Ford	......	......	......	......	......	......	24·4	......
Bena	16·1	15·1	14·8	......	......	20·3	19·1	......
Gallipoli	......	......	......	......	......	15·7	19·2	......
Federation ...	......	......	......	......	......	......	......	......
Union	......	......	......	12·6	......	......	......	......
Dundee	15·1	......	......	......	......	......	......	Failed.
Ranee	......	......	......	......	......	......	......	......
Nabawa	13·4	......	......	......	......	......	......	......
Bobin W... ...	Damaged.	14·2	......	8·3	29·9	Failed.	25·0	28·4
Waratah ...	9·6	5·3	9·8	8·2	......	Failed.	24·3	32·6
Duchess	7·7	......	......	......	......	14·0	20·3	31·7
Aussie	......	......	10·2	......	......	......	......	26·2
Bredbo	......	......	......	13·6	......	......	......	......
Queen Fan ...	......	......	......	......	22·5	......	......	......
Cadia	......	......	......	......	29·5	......	......	......
Exquisite ...	......	......	......	......	......	17·4	......	......
Duri	......	......	......	......	......	......	......	......
Rajah	......	......	......	......	......	......	......	......
Cullen	......	......	......	......	......	......	......	......
Geeralying ...	......	......	......	......	......	......	......	......
Ghurka	......	......	......	......	......	......	......	......
Gurrawa	......	......	......	......	......	......	......	......
Riverina ...	......	......	......	......	......	......	......	......
Sepoy	......	......	......	......	......	......	......	......
Bald Early ...	......	......	......	......	......	......	......	......

of Wheat Variety Trials.

	Walbundrie.	Bidgeemia.	Urangeline.	Milbrulong.	Finley.	Jerilderie.	Mathoura.	Balranald.	Walkyrie.
	E. Barker.	T. Ralston.	D. J. McLelland.	J. M. Gollasch	W. Waite.	F. McPherson.	W. Glenn.	H. Oberin.	H. McCrum.
	Brown loam	Black plain, new land.	Red loam	Red granite loam.	Red clay loam, plain.	Red clay loam, plain.	Red clay loam, plain.	Red sandy loam, mallee	Brown loam.
	Mouldboard 4½ in. July.	Mouldboard 4 in. August.	Mouldboard 4½ in. July.	Mouldboard 4½ in. July.	Mouldboard 4 in. July.	Sundercut 4 in. May.	Mouldboard 4 in. August.	Mouldboard 3 in. August.	Mouldboard 4 in. July
	Harrowed September, scarified October and February, harrowed March, scarified April.	Smoodged September, spring-toothed October and January, smoodged March and spring-toothed, spring-toothed again April	Spring-toothed October, February and April.	Spring-toothed September, scarified October, December, February and April.	Spring-toothed September, again October, disced February, harrowed March, spring-toothed June.	Springtoothed September, again March, harrowed May.	Harrowed August, spring-toothed October and twice after harvest—January and April.	Springtoothed April and May.	Scarified March, spring-toothed twice April, and harrowed.
	30th April.	26th April.	Early wheats sown 14th May, remainder 30th April.	Early wheats sown 12th July, remainder 27th April.	3rd July.	20th May.	28th May.	15th May.	Early wheats sown 6th May, remainder on 24th April.
	65	65	80	65	70	60	60	60	75
	84	60	100	112	100	60	80	None.	60
	Combined and harrowed.	Hoe drilled and harrowed.	Hoe drilled and harrowed.	Hoe drilled and harrowed.	Combined.	Combined.	Combined.	Combined.	Hoe drilled and harrowed.
	......	......	......	......	......	......	Gallipoli and Nabawa damaged by grass-hoppers.	......	......
	bus.	bus.	bus. *	bus.	bus.	bus.	bus.	bus.	bus.
	23·4	30·7	22·2	25·1	......	......	......	14·1	16·1
	18·0	......	23·6	......	......	......	......	......	......
	......	......	......	......	......	......	......	......	......
	17·8	......	......	......	......	......	......	......	16·0
	......	......	......	......	......	......	......	19·1	......
	......	......	25·1	......	......	......	......	......	......
	20·2	29·1	......	32·0	......	......	......	......	......
	......	......	......	31·1	......	......	16·0	20·0	......
	......	......	......	......	14·1	19·4	13·5	......	......
	......	......	29·4	31·5	15·1	21·6	18·6	11·3	......
	......	......	33·9	36·4	......	......	......	......	......
	......	26·2	......	......	13·1	26·1	18·0	20·0	......
	......	31·4	......	......	22·2	23·6	15·1	16·8	13·7
	24·1	26·1	41·1	Failed.	15·3	29·3	......	......	10·3
	22·8	25·2	40·3	Failed.	21·1	......	23·0	12·0	12·4
	17·1	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	......	14·4	7·2
	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	......	......	......
	......	......	......	......	......	......	......	......	......
	......	25·8	......	......	......	29·9	......	......	13·4
	......	24·6	......	......	13·0	......	20·0	......	......
	......	......	......	......	10 7	......	......	21·0	......
	......	......	......	......	......	27·4	......	......	10·2
	......	......	......	......	......	......	15·0	......	......
	......	......	......	......	......	......	......	15·1	......
	......	......	......	......	......	......	......	9·6	......
	......	......	......	......	......	......	......	15·7	......
	......	......	......	......	......	......	......	18·1	......

CULTURAL Details and Yields of Oat Variety Trials.

District ...	Jindera.	Holbrook.	Tumbarumba.	Uranquinty.	Walkyrie.	Walbundrie.	Bidgeemia.	Milbrulong.	Jerilderie.
Experimenter ...	G. Nation.	G. Perry.	T. McAuliffe.	T. Rodham.	H. McCrum.	E. Barker.	T. Ralston.	J. M. Gollasch.	F. McPherson.
Nature of soil ...	Brown loam ...	Brown loam ...	Red volcanic loam.	Red granite loam.	Brown loam ...	Brown loam ...	Black plain, new land.	Red granite loam.	Red clay loam, plain.
Ploughing ...	Mouldboard 4½ in. August.	Sundercut 4 in. July.	Mouldboard October.	Mouldboard 4 in. July.	Mouldboard 4 in. July.	......	Mouldboard 4 in. August.	......	Sundercut 4 in. May.
Cultivation ...	Harrowed September, scarified October and February, disced March, scarified April.	Disced February, springtoothed March.	Harrowed December, springtoothed twice March, and again April.	Harrowed September, springtoothed October, again February, again May.	Scarified March, springtoothed twice April, harrowed April.	Disced February scarified April, harrowed April.	Smoodged September, springtoothed October and January, smoodged and springtoothed March, springtoothed April.	Sundercut 3 in. March, scarified April.	Springtoothed September and March, harrowed May.
Date of sowing ...	28th April.	6th May.	12th April.	6th May.	24th April.	20th April.	26th April.	Algerian on 17th April, remainder on 6th May.	20th May.
Seed per acre ...	60 lb.	60 lb.	65 lb.	65 lb.	80 lb.	55 lb.	60 lb.	60 lb.	40 lb.
Superphosphate per acre	90 lb.	80 lb.	90 lb.	90 lb.	None.	84 lb.	40 lb.	84 lb.	60 lb.
How sown ...	Combined and harrowed.	Combined and harrowed.	Hoe drilled. *	Combined.	Hoe drilled and harrowed	Combined.	Hoe drilled and harrowed.	Hoe drilled.	Combined.
Remarks ...	......	......	......	......	......	Sown on stubble.	......	Sown on stubble.	......
Varieties.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Algerian ...	18·1	......	36·1	......	†	24·1	38·6*	21	......
Belar ...	28·9	17·1	32·4	11·7	†	21·3	......	18	17·1
Buddah ...	......	......	......	......	......	......	......	......	29·1
Guyra ...	20·6	13·8	26·1	13·6	......	......	......	19	......
Gidgee ...	......	......	33·6	......	†	16·6	28·9	15	......
Mulga ...	......	......	......	......	†	20·5	28·1	18	......
Palestine ...	......	......	......	......	......	16·3	......	......	......

* Farmer's own seed. † Failed on account of flooding.

YIELDS in Wheat Fertiliser Trials.

District	Gerogery.	Uranquinty.	Bidgeemia.	Milbrulong.	Finley.
Experimenter	C. W. Moll.	T. Rodham.	T. Ralston.	J. Gollasch.	W. Waite.
	bus.	bus.	bus.	bus.	bus.
No. manure	...	...	21·2	21·0	8·9
40 lb. superphosphate per acre	...	18·0	24·6	22·0	...
56 lb. „ „ ...	...	...	...	...	...
84 lb. „ „ ...	18·2	...	31·4	23·0	...
95 lb. „ „ ...	...	16·1	...	...	14·1
112 lb. „ „ ...	...	...	...	25·0	...
140 lb. „ „ ...	22·2	...	...	...	...
98 lb. P11 mixture per acre	12·2	...	...	23·0	10·7
112 lb. P15 „ „ ...	13·1	...	...	23·0	9·9
126 lb. M17 „ „ ...	15·1	...	...	25·1	11·9

NOTE.—Marshall's No. 3 was the variety used at Gerogery, Yandilla King at Uranquinty and Milbrulong, Nabawa at Bidgeemia and Federation at Finley.

P11 fertiliser mixture consists of 6 parts superphosphate and 1 part sulphate of ammonia, P15 of 3 parts superphosphate and 1 part sulphate of ammonia, and M17 of 2 parts superphosphate and 1 part sulphate of ammonia.

Superphosphate alone would still appear to be the best general manure for wheat. On fallowed land wheat does not respond to nitrogenous fertilisers as contained in P11, P15 and M17 mixtures. The increased yield due to the application of 84 lb. superphosphate at Bidgeemia is worthy of note. Previously many considered 40 lb. per acre sufficient on new land.

Oat Varieties Under Trial.

Cultural details and yields of the oat variety trials are given in the table on page 366. Very few good oat crops were produced in the district last season.

Oats Rate of Seeding Trial.

On brown loam on Mr. E. Barker's property at Walbundrie oats sown at the rate of 45 lb. seed per acre yielded 21·3 bushels per acre as compared with 18·3 bushels when seeded at the rate of 60 lb. per acre. The cultural details are the same as in the oat variety trial. Algerian was the variety used.

Fertiliser Trial with Oats.

A fertiliser trial with grain varieties was carried out by Mr. E. Barker, Walbundrie, and with hay varieties by Mr. E. Hamblin, Ganmain. For cultural details, see table giving results of oat variety trials.

The yields at Ganmain are rather good, considering the plots were sown on stubble. In previous years M17 fertiliser mixture did not give such good results and its prominence last year was probably due to the abnormally wet conditions resulting in lack of nitrogen in the soil.

YIELDS in Oat Manurial Trials.

District ... Experimenter ...	Walbundrie. E. Barker.	Ganmain. E. Hamblin.
	bus.	t. cwt. qr. lb
50 lb. superphosphate per acre ...	21·3	1 11 2 4
84 lb. " " ...	16·6	1 12 1 26
60 lb. P11 mixture per acre ...	......	1 12 0 5
90 lb. P11 " " ...	22·5	....
78 lb. P15 " " ...	......	1 15 3 9
112 lb. P15 " " ...	19·4	....
84 lb. M17 " " ...	......	1 19 3 18
126 lb. M17 " " ...	18·4	....
No manure ...	18·7	1 8 3 7
112 lb. Cresco ammonium phosphate	......	1 15 2 5

NOTE.—P11 fertiliser mixture contains 6 parts superphosphate and 1 part sulphate of ammonia; P15 contains 3 parts superphosphate and 1 part sulphate of ammonia; M17 contains 2 parts superphosphate and 1 part sulphate of ammonia.

Wheat and Oat Diseases.

Diseases were not so prevalent as in 1930, a little foot-rot, take-all and flag smut being present. It has been demonstrated that a good early stubble burn followed by a rotation crop of oats will materially control flag smut. The early break in the weather also assisted last season. The abnormal season was responsible for the prevalence of a kind of root and crown rot that might easily have been mistaken for foot-rot. It resulted in discolouration and rotting at the base and many empty heads.

Leaf spot was very prevalent during the winter, giving the crops a further check. A heavy infestation of rust also occurred during the late spring, causing considerable damage to the oat crops, which were also attacked by caterpillars just prior to harvest.

Murrumbidgee Irrigation Area (Yanco–Leeton End).

H. J. DARGIN, Agricultural Instruct

A number of farmers co-operated with the Department of Agriculture in conducting experiments with wheat and oats on the Yanco-Leeton end of the Murrumbidgee Irrigation Area and on adjoining dry areas during the 1931 season.

The Season.

Dry and adverse seasonal conditions have been the rule throughout these localities for the four years commencing 1927, but the past season provided a wet and altogether different set of seasonal conditions to those experienced by farmers in this district for many years past. During the fallowing period heavy periodical rains fell, and while such conditions enabled the farmers to plough their land satisfactorily, generally speaking the fallows did not receive as much working as usual, and were only cultivated as often as was necessary to assist sheep in controlling weed growth. Between June and September, 1930, over 12½ inches of rain were registered; a further 4½ to 5 inches fell

Cultural Details and Yields of Wheat Variety Trials.

	Irrigable Area Plots.					Dry Area Plots.					
District	Murrami.	Murrami.	Murrami.	Leeton.	Sth. Gogeldrie.	Brobenah.	Brobenah.	Fivebough.	Fivebough.	Yanco.	Yanco.
Experimenter	W. R. Clarke, Farm 493.	K. B. R. Harrison, Farm 1132.	C. K. Lynes, Farm 1467.	L. Sneison, Farm 1387.	S. H. Cox, Farm 1710.	T. C. Davies, "Parkside."	R. McKenzie, Allambie.	J. H. Trethewey, Farm 30.	Maybon Bros., Farm 29.	J. Cameron, Farm 8	G. Dodson, "Edenhope."
Nature of soil	Grey clay loam, 8 in. deep.	Red clay loam (stiff), 6 in. deep.	Grey clay loam, 6 in. deep.	Red to grey clay loam, 4 in.	Red loam (light), 8 in. deep.	Red gravelly loam, 6 to 8 in.	Red loam, 12 in.	Chocolate loam 8 in.	Red loam, 6 to 8 in.	Red loam (light), 12 in.	Red loam, 4 to 6 in.
Ploughing	Disc ploughed 5 in. early January.	Disc ploughed 4 in. early December.	Disc ploughed 4 in. February.	Mouldboard 4 in. June.	Mouldboard 6 in. September.	Mouldboard 4 in. September.	Mouldboard 4 in. June.	Disc ploughed 4 in. August.	Mouldboard 3rd July.	Mouldboard 5 in. July	Disc ploughed 4 in. August.
Cultivation	Harrowed February, duckfoot cultivated mid-April.	Sundercut February, springtoothed and harrowed mid-April.	Sundercut early April, harrowed 22nd April, cross harrowed 23rd April.	Sundercut September, springtoothed December, irrigated 3rd February, springtoothed March.	Disc cultivated November, again March, harrowed April.	Springtoothed October, March, May and June.	Springtoothed August, October, November, February and April.	Wimmera scarified.	Springtoothed October, again early November, again in November, April and May.	Springtoothed November, December, March, disc cultivated. May.	Rigid-tine cultivated September and April.
Date of sowing	26th April.	18th to 23rd April.	30th April	2nd April.	14th April.	5th June.	1st May.	23rd April.	12th May.	16th June.	18th and 19th May.
Seed per acre... ...	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.
Superphosphate per acre	70 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.
Remarks	......	......	Yields of all varieties reduced by flood conditions and stem rust.	Yields of all varieties greatly reduced by foot-rot.	Flood conditions reduced yields all varieties: Nabawa and Baringa also through lodging.	... ...	Yields of Federation, Nizam, Bena and Union slightly reduced by flag smut.	Wet conditions and two water courses running through plots considerably reduced yields. Yields further reduced all varieties, except Exquisite, by flag smut.	Yields of Nizam, Bena, Duchess and Federation reduced by flag smut. Yields further reduced by two watercourses through plots.	Ranee, Hard Federation, Rajah, Bobin and Waratah reduced by loose smut.	Yields of Ranee, Canberra and Gluyas Early reduced by flag smut, Ranee, and Geeralying by foot-rot.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	......	......	......	......	......	18 56	......	......	......	......	......
Barwang	......	......	......	......	19 30	......	......	......	......	......	......
Baringa	......	......	18 0	......	21 0	......	31 48	......	26 9	......	......
Bena	......	......	18 28	......	25 30	......	31 17	......	24 46	......	......
Bobin	......	......	......	......	......	19 7	......	......	......	12 31	......
Canimbla	19 29	......	......	......	......	......	......	......	......	......	19 4
Canberra	......	......	......	......	......	......	......	......	......	......	......
Cleveland	14 14	19 33	......	23 47	......	......	......	......	......	......	......
Currawa	16 2	......	......	......	......	......	......	24 5	......	......	......
Duri	......	......	......	......	......	19 39	......	......	......	14 3	......
Duchess	......	......	......	......	......	......	......	......	27 20	......	......
Exquisite	......	23 46	......	......	......	......	......	27 20	......	......	......
Federation	......	......	24 0	......	22 30	......	27 21	......	26 42	......	......
Ford	......	......	24 14	......	22 30	......	34 16	......	29 40	......	......
Free Gallipoli	22 17	25 7	......	35 0	......	......	......	22 35	......	......	......
Gluyas Early	......	......	......	......	......	......	......	......	......	12 30	21 6
Geeralying	......	......	......	......	......	......	......	......	......	......	19 49
Hard Federation	......	......	......	......	......	19 3	......	......	......	14 15	......
Marshall's No. 3	......	21 34	......	32 41	......	......	......	27 5	......	......	......
Nabawa	......	......	24 28	......	19 30	......	29 20	......	24 40	......	17 40
Nizam...	......	......	21 10	......	21 0	......	29 14	......	21 8	......	......
Penny	23 20	17 3	......	27 40	......	......	......	25 52	......	......	......
Ranee	......	......	......	......	......	14 25	......	......	......	12 18	19 39
Rajah	......	......	......	......	......	17 57	......	......	......	12 6	22 57
Riverina	......	......	......	......	......	......	......	......	......	......	21 32
Turvey	19 27	......	......	......	......	......	......	26 10	......	......	......
Union	......	......	21 14	......	......	......	30 25	......	......	......	......
Waratah	......	......	......	......	......	17 54	......	......	......	14 44	......
Wandilla	......	17 47	......	24 35	......	......	......	......	......	......	......
Yandilla King	22 19	21 25	......	34 3	......	......	......	23 40	......	......	......

from January to the end of March. With such conditions, the seed beds were in a moist, and in a number of cases wet, state at time of sowing, more particularly as up to 2½ inches fell in April, a further 4½ inches in May, and 4½ inches during June. Such wet conditions delayed the sowing of some of the plots of midseason and early-maturing varieties.

Satisfactory germinations and stooling were obtained on most of the plots and some fairly heavy yields were obtained on the dry areas, particularly in localities where drainage was good.

The plots located on the irrigable section of the area suffered somewhat during this record wet season, and the crops were barely as good as usual This is only to be expected, as a great many of the soils in this section of the area are of a heavy texture, and, principally owing to their location, are subject to a degree of flooding on account of poor drainage during such wet periods.

The season remained cool until well into December, a condition which greatly assisted in filling the heads of the wheat and oat plants with full plump samples of grain. Those plots sown late in the season benefited greatly by these cool conditions.

The following rainfall registrations recorded at Leeton give a fair indication of the conditions which prevailed throughout the district :—

On the Fallow.—June (1930) 175 points, July 120 points, August 198 points, September 46 points, October 249 points, November 181 points, December 293 points, January (1931) 76 points, February 58 points, March 289 points; total 1,685 points.

On the Crop.—April (1931) 179 points, May 451 points, June 455 points, July 94 points, August 43 points, September 117 points, October 75 points, November 188 points; total 1,602 points.

The Wheat Variety Trials.

The table on page 369 gives the results of the wheat variety trials on both the irrigable and dry areas.

Among the early-maturing wheats Hard Federation, Bobin and Duri were outstanding on the dry areas during the past season. This year Geeralying was sown on the plots for the first time and its heavy-yielding qualities and resistance to disease are likely to place it among the leading early wheats in this district. Owing to continuous rain delaying sowings and subsequently keeping the ground in a wet state, more particularly during the early growing stages, the past season proved to be one of the most unsuitable experienced for many years for these early wheats.

Throughout both the dry areas and the irrigable sections Nabawa and Ford have been the outstanding mid-season wheats, while the new variety, Baringa which was tested here for the first time, yielded very well. Its resistance to flag smut appears to be somewhat similar to those resistant qualities displayed by Nabawa, while its straw proved considerably stronger than that of Nabawa.

Amongst the late-maturing varieties Yandilla King, Penny, Marshall's No. 3 and Free Gallipoli gave the best results. Yandilla King is still the most sought-after wheat in these localities for early sowing on either dry areas or irrigable country.

Oat Grain Variety Trials.

Oat grain variety trials were conducted on three farms, but one trial failed owing to floods. The yields at the other two centres are shown in the following table. These two trials were located on irrigation farms which had previously grown rice, but owing to the wet conditions prevailing last season, irrigation was not necessary.

CULTURAL Details and Yields of Oat Trials.

District ... ... Experimenter	Murrami. C. K. Lynes, Farm 1457.	South Gogeldrie. S. H. Cox, Farm 1710.
Nature of soil	Grey clay loam, 6 inches ...	Light red loam, 8 inches.
Ploughing	Disced 4 inches February ...	Mouldboard 6 inches September.
Cultivation	Sundercut early April, harrowed end April, cross-harrowed May.	Disc cultivated November and March, harrowed April.
Date of sowing	2nd May	15th April.
Seed per acre	60 lb.	60 lb.
Superphosphate per acre ...	60 lb.	60 lb.
Remarks	Yields of Lachlan and Belar reduced by lodging.	Yields of all varieties except Palestine reduced by shedding.
Varieties.	bus. lb.	bus. lb.
Algerian	36 10	....
Belar	27 14	....
Buddah	....	29 10
Gidgee	....	21 5
Guyra...	27 14	....
Lachlan	30 12	....
Mulga	....	24 15
Palestine	....	39 4
Sunrise	....	22 30

Palestine again proved to be a particularly heavy-yielding variety which does not thresh out to any extent during the November windstorms. It possesses a short straw and has not shown any signs of lodging.

Algerian again yielded very well and is undoubtedly the best oat for general purposes grown on these areas.

Buddah, Lachlan, Belar and Guyra all yielded fairly well, while Mulga fills the heads well, but if not harvested immediately on ripening it invariably sheds badly and consequently has lost favour in this locality.

Murrumbidgee Irrigation Area (Griffith End).

E. B. FURBY, H.D.A., Agricultural Instructor.

During the 1931 season a number of farmers at the Griffith end of the Murrumbidgee Irrigation Area co-operated with the Department in carrying out wheat variety, manurial, and rate of seeding trials, and also oat variety and fertiliser trials.

The Season.

The rainfall given hereunder is that recorded at the official station in Griffith. Records from the individual centres where plots were sown are not available. Although there must be some variation in different parts of the district, the general effect of the rainfall during the periods mentioned was much the same in each place.

Rainfall during the Fallow Period.—June, 215 points; July, 80 points; August, 232 points; September, 65 points; October, 412 points; November, 102 points; December, 492 points; January, 76 points; February, 27 points; March, 357 points; total, 1,858 points.

Rainfall during the Effective Growing Period.—April, 163 points; May, 382 points; June, 509 points; July, 122 points; August 52 points; September, 116 points; October, 81 points; total, 1,325 points. Total rain during fallow period and on the crop amounted to 31·83 inches.

The season was the best experienced here for a number of years, particularly for the dry area settlers, who have experienced a long succession of crop failures. It will be seen that from March onward very good falls were recorded. These, however, had their serious drawbacks, inasmuch as the land could not be satisfactorily worked for the destruction of weeds, while sowing operations were also seriously curtailed. The excessively wet conditions during June and July further delayed sowing, besides water-logging crops already sown. For the finishing-off of the crops, conditions were generally very good, although in some parts a dry spell in September almost caused partial failures.

The winter was a moderately mild one, consequently damage by frost was not recorded.

Wheat Variety Trials.

Apart from the mallee plots the soils on the other dry area plots were very similar, all varieties, therefore, being tested under practically identical conditions. The three outstanding varieties in these plots were Nabawa, Bobin, and Sepoy.

Nabawa is extensively grown in the district with much success, and can be regarded as a standard variety. There has been some evidence of weakness in the straw, particularly under irrigation conditions.

Bobin, so far, has been confined mostly to trial plots, but is gaining distinction for its consistently good yields. All experimenters intend growing larger areas of this variety.

Sepoy has a fairly wide reputation among farmers from Victoria. Experience in trial plots has shown that it stands adverse conditions tolerably well and can be relied upon to fill the bags. It is subject to flag smut, but the infection this year was much less than in the case of Waratah.

Ford is another promising variety, particularly for the irrigated area, where it has been shown to be fairly free from disease, and has stood up well to watering. On the dry area good yields have also been obtained under adverse conditions.

CULTURAL Details and Yields of Wheat Variety Trials.

	Dry Area.				Irrigated Land.	
District	Yenda.	Yenda.	Griffith.	Tabbita.	Beelbangera.	Griffith.
Experimenter ...	A. J. Cruickshank, "Rothdene."	T. H. Burcher, "Yarrandah."	F. Holt, Griffith.	A. A. Rewell, "Anaconda."	S. H. Kelly, Farm 529.	E. C. Gregory, Farm 1784.
Nature of soil ...	Red, sandy loam.	Red virgin mallee.	Red loam ...	Red, sandy loam.	Heavy red loam.	Heavy red loam.
Ploughing ...	Sundercut, December, 1930.	Not ploughed.	Mouldboard, 4 in. September, 1930.	Mouldboard, 4 in. August, 1930.	Mouldboard, 3 in. early in March.	Mouldboard, 4 in. August.
Cultivation ...	Combined January and March, harrowed and combined April, sown with combine.	Scarified early May, sown with disc drill.	Springtoothed just prior to sowing with combine.	Scarified September, October and March after rain, scarified early April, sown with combine.	Sundercut March, springtoothed and harrowed just before sowing.	Scarified October, harrowed November, scarified March, harrowed April, sown with combine.
Date of sowing ...	12th May.	28th May.	15th June.	13th June.	Early April.	21st April.
Seed per acre...lb.	60	45	60	60	60	60
Superphosphate per acre......lb.	60	45	60	60	60	60
After treatment ...	Harrowed after sowing.	......	....	....	Harrowed after sowing.	....
Remarks	......	Yandilla King sown too late.	Crop sown in very wet land.	....	Cleveland and Carinda too late. Old rice land.	Nabawa lodged badly.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Nabawa	26 1	......	17 40	19 12	11 24	31 0
Penny	......	......	....	19 7	9 30	35 46
Currawa	......	18 55	....	....	10 30	....
Yandilla King ...	......	5 23	....	....	12 27	30 30
Ford	23 33	16 5	....	15 1	18 0	....
Bobin	24 8	18 30	19 51	18 47	....	....
Duchess	20 53	......	15 35	....	....	....
Federation ...	24 48	......	15 10	....	....	33 20
Sepoy	27 3	......	18 10	21 56	....	....
Bald Early ...	......	......	17 48	13 46	....	....
Ranee	......	......	18 16	13 10	....	....
Union	......	......	....	12 3	....	....
Geeralying ...	......	12 5	....	....	....	....
Free Gallipoli ...	......	20 31	....	....	....	....
Exquisite ...	20 11	......	....	....	....	....
Bredbo	22 39	......	....	....	....	....
Baringa	......	......	....	....	13 20	....
Carinda	......	......	....	....	9 28	....
Cleveland ...	......	......	....	....	9 28	....
Nizam	......	......	15 10	....	....	....
Wandilla	......	......	....	....	....	34 56
Marshall's No. 3 ...	......	......	....	....	....	32 10

Geeralying has been tried out on the mallee, and although not yielding too well this year it is a useful variety, being a tall grower and at least fourteen days earlier than any other variety in the trial. It was also fairly free from flag smut. The straw showed signs of weakness.

Duchess was late maturing and the quality of the grain was poor. There was nothing outstanding about this variety to suggest that it could be used with satisfaction here. Exquisite appeared to be fairly free from flag smut, but was too late maturing.

Yandilla King, under irrigation, gave the heaviest yield, whilst on the mallee it was almost a failure, due to the late planting. Many complaints were voiced with regard to the behaviour of this variety last season, particularly on the Irrigation Area, where the yields from it have been very disappointing. Sowing too late would largely account for this.

Free Gallipoli gave the best yield on the mallee; it stooled very well, and had good heads. It was badly infected with flag smut, which, however, did not materially diminish the yield. It appears to be a variety worthy of consideration for the district.

Wheat Manurial Trials.

The most noticeable feature of the trials of the dry area was the backward early growth of the unmanured plots as compared with the vigorous early growth of the most heavily manured plots. This difference in growth was not maintained for long, medium applications of superphosphate eventually showing to advantage in at least two cases.

Although neither of the trials on the irrigation section was irrigated prior to sowing or in the spring, both were on land which had been under cultivation for a number of years, and this would partly account for the increase from the heavy applications in the case of Mr. Long's plots at Griffith.

CULTURAL Details and Yields of Wheat Manurial Trial.

	Dry Area.			Irrigation Area.	
District ... ... Experimenter... ...	Yenda. A. J. Cruickshank, "Rothdene."	Griffith. F. Holt.	Tabbita. A. A. Rewell.	Griffith. C. A. Long.	Griffith. W. Dickie.
Nature of soil... ...	Same as in wheat variety trials.	Same as in wheat variety trials.	Same as in wheat variety trials.	Red loam.	Heavy red loam.
Ploughing	" ...	" ...	" ...	Disced August, 1930.	Sundercut August, 1930.
Cultivation	" ...	" ...	" ...	Ploughed March, 1931, disc cultivated April and just before sowing with combine.	Ploughed 5 inches January and scarified, disc cultivated April, sown with combine.
Date of sowing ...	12th May	15th June.	13th June.	18th April.	1st May.
Seed per acre ... lb.	60	60	60	60	60
After treatment ...	....	....	....	Should have been fed off.	....
Remarks	....	....	....	....	Plots flooded during winter.
Variety used ...	*Waratah.*	*Waratah.*	*Waratah.*	*Marshall's No. 3.*	*Yandilla King.*
Superphosphate per acre—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No manure ...	21 10	13 4	9 7	17 20	12 0
45 lb.	21 15	17 35	14 25	....	....
60 "	21 4	....	14 28	19 5	....
75 "	20 50	....	....	....	....
65 "	....	17 25	....	....	....
98 "	....	14 45	....	....	....
90 "	....	....	12 9	....	....
112 "	....	....	....	23 52	12 0
140 "	....	....	....	27 2	12 0

Rate of Seeding Trials Inconclusive.

Trials were conducted on the farms of Messrs. Long and Dickie under the same conditions as the manurial trials, the varieties used being Marshall's No. 3 and Yandilla King respectively. The results were inconsistent and do not permit of any definite conclusions being drawn. Experience, however, points to the necessity for heavier sowings on land which been under cultivation for a number of years.

YIELDS in Wheat Rate of Seeding Trials.

Seed per acre.	C. A. Long, Griffith.	W. Dickie, Griffith.
	bus. lb.	bus. lb.
46 lb.	18 43	21 0
60 lb.	16 30	21 38
73 lb.	17 8	14 30
89 lb.	21 40	19 18

Mr. Long's trial was sown on 19th April, and the other trial on 1st May. Superphosphate at the rate of 60 lb. per acre was applied in each case.

Oat Variety Trials for Hay and Grain.

Varieties for hay were tried out on Mr. E. C. Gregory's farm (No. 1784), Griffith. The soil, a heavy red loam, was mouldboard ploughed August, 1930, scarified early in March, harrowed in April, and combine sown on 21st April, using 60 lb. seed and 60 lb. superphosphate per acre. The plot was not irrigated prior to sowing nor in the spring.

Lachlan yielded 3 tons 6 cwt. 2 qr., Gidgee 3 tons 3 cwt., Belar 3 tons, and Buddah 2 tons 15 cwt. 1 qr. per acre.

Lachlan and Gidgee were the two most promising oats, having good fine straw with large prolific heads. The colour of the straw of Gidgee, however, was poor, and as regards general suitability it does not compare favourably with the standard variety, Algerian. Buddah showed a good grain crop but the straw was coarse.

The grain variety trial was sown on Mr. V. A. Edwards' farm (No. 615), Beelbangera. The soil here is also a heavy red loam. It was ploughed in January, watered in February, and subsequently worked several times with a sundercut. Seed at 80 lb. per acre was sown on 5th April, along with superphosphate at the rate of 60 lb. per acre. The crop was not watered in the spring.

The yields were :—Algerian 56 bus. per acre, Lachlan 48 bus., Sunrise 32 bus., Guyra 29 bus., Buddah 28 bus. and Mulga 24 bus.

Lachlan proved its usefulness, comparing very favourably with Algerian, a variety which for all purposes on the Irrigation Area is very difficult to replace on account of its general hardiness.

Mulga has been tried here for a number of years and has proved a comparative failure. It is certainly an early oat, but rarely makes a satisfactory growth for any purpose. Even for early grazing it cannot compare with Sunrise or Algerian.

The only feature in favour of Buddah was its full grain.

Oats Fertiliser Trial.

This trial was sown in conjunction with Mr. E. C. Gregory's oat variety trial, and the variety used was Algerian. Although the highest yields were obtained from the heaviest applications, the increases were not sufficient to warrant, at any rate, as much as 140 lb. per acre as a general practice, at least under our present farming methods.

The yields in this trial were as follows:—

	bus.	lb.
No manure	38	27
56 lb. superphosphate	44	0
112 "	49	14
140 "	48	0

Federal Capital Territory Wheat Trials.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

Although this is the third season that wheat trials have been conducted in the Canberra district, it is not yet possible to make any definite recommendations as to varieties. As to the advisability of using superphosphate, it is a different matter, for in each trial each season definite increases in yield have been obtained.

The Best Season for Some Years.

The season was very satisfactory throughout, in fact one of the best experienced for some years. Rainfall from sowing until harvesting was regular in incidence, any slight falling off in the spring being more than compensated for by the heavy falls during May and June, for which two months the total was over 12 inches. Certainly heavy rain like this during the winter precluded satisfactory grazing off of the young crops, as is the general practice, but satisfactory yields were obtained.

Rainfall during Fallow Period.—September, 66 points; October, 421 points; November. 105 points; December, 96 points; January, 72 points; February, 21 points; March, 234 points; total 1,015 points.

Rainfall during Growing Period.—April, 147 points; May, 617 points; June, 586 points; July, 109 points; August, 114 points; September, 152 points; October, 101 points; November, 152 points; December, 117 points; total 2,095 points.

The Variety Trials.

It was pleasing to see the recommended and generally favoured variety Yandilla King return to its high yielding standard. In the 1930 season Yandilla King yielded very poorly, and many, not knowing its proven

capabilities, were rather inclined to place this variety in the discard for its failure in this one season. Certainly in the trial at Weetangera with Messrs. Kilby Bros. it did not yield as heavily as some of the other varieties, but this is more than discounted by the result obtained in the other trial and its performances over a fairly lengthy period of years.

It is not desirable to grow a multiplicity of varieties in any district. Taking the late-maturing varieties, which are most favoured in this district, we have Yandilla King, Marshall's No. 3, Turvey, Penny, Cleveland and Cadia. Of these the latter two have not done anything to justify persevering with them and may be discarded. Of the others Yandilla King has proven its ability and should be the main late-maturing variety grown. Turvey is not recommended, as although it is a showy variety, with its large, long, open head, it cannot be considered superior as a bag filler to Yandilla King. Marshall's No. 3 has been found to be better suited to lighter soils; it is susceptible to loose smut and flag smut, and although slightly more rust resistant than Yandilla King, may still be termed rust liable. Penny, the heaviest yielder in these trials, although new to this district, is not new to the State. It is rust liable, but has been found to do better on the lighter soils and under drier conditions than Yandilla King.

CULTURAL Details and Yields of Variety Trials.

District ...	Canberra.	Canberra.
Experimenter ...	J. C. Garran.	Kilby Bros.
Nature of soil ...	Light red loam (new land)...	Medium red loam.
Cultivation ...	Mouldboard 4 inches September, harrowed late October, combined February.	Mouldboard 4½ inches October, springtoothed April.
Date of sowing ...	17th April.	4th May.
Seed per acre ... lb.	64	60
Superphosphate per acre lb.	84	56
After treatment ...	Grazed very lightly.	Grazed very lightly
Varieties.	bus. lb.	bus. lb.
Penny ...	47 44	36 5
Yandilla King ...	45 10	30 44
Turvey ...	43 18	33 43
Marshall's No. 3 ...	43 14	31 52
Union ...	42 19	36 34
Cleveland ...	42 19	27 54
Bobin ...	41 17	40 17
Cadia ...	40 56	33 3
Federation ...	40 4	29 3
Nabawa ...	39 32	31 41
Canberra ...	34 11	28 17
Waratah ...	32 46	36 28

Of the mid-season varieties, three (Federation, Nabawa and Union) were under trial. Federation is too well known to require comment. Nabawa has not been grown to any extent in the Territory, as its resistance to flag smut has not been an important factor in recommending it, owing to the

practical absence of the disease in this district. Nabawa has not been a high yielder and the replacement of Federation is not recommended. Union has done remarkably well in these trials. It has consistently given high yields, comparing very favourably in this regard with the later maturers, and in nearly every trial has outyielded Federation, which it closely resembles, but unfortunately is just as susceptible to disease. This variety can be recommended on results to date as being superior to Federation.

Of the early varieties Canberra may be definitely eliminated from consideration. Waratah is recommended as the best early variety to sow in this district. Bobin is a variety that is sure to gain in popularity; it is sligntly later than Waratah, and in the only trials in which it has been tried has outyielded this variety. Its worst feature is its high susceptibility to stem rust and a resultant pinched grain. Bobin should be closely watched in future trials.

Superphosphate Increases Yields.

In the manurial trial on the property of Mr. John Garran interesting results were obtained. The land on which the trial was sown has not been cropped before, yet there were distinct gains in yield from applications of superphosphate, notwithstanding the very high yield obtained from the "no manure" plot.

YIELDS in the Manurial Trials.

Fertiliser.	Experimenters.	
	J. C. Garran, Canberra. (Union variety.)	Kilby Bros., Canberra. (Nabawa variety.)
	bus. lb.	bus. lb.
Superphosphate 240 lb. per acre	47 1	....
Superphosphate 224 " "	....	30 7
Superphosphate 168 " "	45 26	....
Superphosphate 112 " "	....	32 40
Superphosphate 84 " "	46 5	....
Superphosphate 56 " "	....	28 19
No manure	40 52	24 29

NOTE.—The cultural details in the manurial trials are the same as for the variety trials.

"THE PHYSICAL PROPERTIES OF SOILS."

THE importance of a thorough understanding of the physical properties of soils is important, not only from the point of view of cultivation, but also as providing information on the environmental conditions under which the biological activities in the soil proceed. The latest survey of this field of knowledge is contained in *The Physical Properties of the Soil,* by Dr. Bernard A. Keen, Assistant Director and Head of the Soil Physics Department of Rothamsted Experimental Station, England.

Our copy from the publishers, Messrs. Longmans, Green & Co., London.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Bald Early ...	... Manager, Experiment Farm, Trangie.
Baringa	... Mr. H. J. Harley, "Wattle Park," Tullibigeal.
Baroota Wonder	... Manager, Experiment Farm, Trangie.
Bobin	... Manager, Experiment Farm, Trangie.
	Mr. W. E. Ditchfield, "Strathmerton," West Wyalong.
	Mr. D. W. Edis, "Prestonville," Ariah Park.
	Mr. R. Penfold, Quandialla.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
	Mr. B. J. Robards, "Plain View," Nevertire.
	Mr. H. J. Harley, "Wattle Park," Tullibigeal.
Bredbo	... Manager, Experiment Farm, Cowra.
Clarendon ...	... Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Cleveland... ...	... Mr. W. Burns, "Goongirwarrie," Carcoar.
Exquisite	... Manager, Experiment Farm, Cowra.
Geeralying ...	... Mr. J. Parslow, "Cooya," Balladoran.
Gullen	... Mr. J. Parslow, "Cooya," Balladoran.
Nabawa	... Mr. J. Parslow, "Cooya," Balladoran.
	Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. B. J. Robards, "Plain View," Nevertire.
	Mr. H. J. Harley, "Wattle Park," Tullibigeal.
	Mr. J. W. Watson, "Morvada," Merriwagga.
	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Queen Fan ...	... Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Wandilla	... Manager, Experiment Farm, Cowra.
Waratah	... Mr. E. J. Johnson, "Iona," Gunningbland.
	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
	Manager, Experiment Farm, Bathurst.
	Mr. R. M. Gelling, "Cooinoo," West Wyalong.
	Mr. Smith Pollock, "Glengarry," Quirindi.

Oats—

Belar	... Manager, Experiment Farm, Cowra. Mr. C. W. Buckland, "Kangetong," Ootha.
Gidgee	... Manager, Experiment Farm, Trangie.
Guyra	... Manager, Experiment Farm, Bathurst. Messrs. Walker Bros., Wattamondara.
Mulga	... Manager, Experiment Farm, Trangie. Mr. C. Bennett, "Theole," Forbes-road, Cowra.
Palestine	... Mr. C. W. Buckland, "Kangetong," Ootha.
White Tartarian	... Manager, Experiment Farm, Bathurst.

Tomatoes—

Improved Sunnybrook Earliana ...	... Mr. Albert Sorby, Macquarie Fields.

Cucumbers—

Early Fortuna ...	... Mr. W. Parry, Terrigal.

Grasses—

Perennial Rye Grass	... Mr. C. Watson, Pyree, via Nowra.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6,200
Swane Bros.	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

C. G. SAVAGE, Director of Fruit Culture.

Cucumber Seed.

Total Requirements can be Produced Locally.

JOHN DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

THAT the climatic and soil conditions of New South Wales are ideally suited to the production of cucumbers is evidenced by the glut of this vegetable on the Sydney market each summer. Despite these facts, practically the whole of the seed used locally (amounting to some tons) is imported from foreign countries

A Typical Hill of Cucumbers.
Indicating right stage for seed production

The saving of cucumber seed is rather a tedious operation, requiring the same thoroughness demanded by tomato seed production, which process was described in the April issue of this *Gazette*. The efforts of several growers to save cucumber seed for their own use have come under notice, but usually these efforts have resulted in the production of a stained sample of seed, which, although quite suitable for the grower's own requirements, would not be up to the standard required of commercial seed.

Methods Adopted by Messrs. Parry Brothers.

After harvesting 3,500 half-bushel cases from a very heavy 4-acre crop of excellent quality Early Fortuna cucumbers, Messrs. Parry Bros., of Terrigal, were left with over 4,000 cases on the vines, which a falling market made it unprofitable to harvest. It was therefore decided to treat the best of this surplus for seed production. No machinery being available, the job had to be undertaken by hand labour, which naturally added considerably to the cost of production. Incidentally, it might be mentioned that fully 99 per cent. of Messrs. Parry Bros.' surplus crop was considered suitable for seed production. At this stage it might also be well to clear up a common misunderstanding that exists among many growers regarding the stage of maturity at which vegetable are most suitable for seed production. Generally speaking, they should be well past the marketable stage. For example, cucumbers at the best marketable stage of maturity are quite unsuitable for seed production as the seeds then are jelly-like and hardly formed up. By the time the seed is mature enough to save, the vegetable is far past the stage at which it is fit for consumption. Some of the cucumbers from which the Parry Bros. saved seed were over a foot in length and 4 inches in diameter.

Extracting the Seed.

To extract the seeds, each cucumber is cut in halves lengthwise, and the seed and juice along with some of flesh scooped out by means of a suitably-shaped piece of wood or some such object affixed to a tub or other container in such a manner that the seeds, &c., as scooped out fall into this container. At the end of each day the mixture is transferred to a barrel and allowed to ferment. It is understood that the fermentation brought about by yeasts produces a better coloured seed than the seed fermented by moulds. The first batch of seed obtained by Messrs. Parry Bros. was mixed with the juice obtained from several dozen overripe cucumbers. These cucumbers were full of frothy active solution, which readily acted on the fresh juice, so that at the end of twelve hours the solution was completely fermented, having a deep foam on the surface. It was constantly stirred to encourage an even "working" of the solution. It is a difficult matter to estimate when the seed has been fermented sufficiently, for while some seeds become detached from the flesh in a very short time, others adhere for a considerable time. Experience alone will enable one to judge this point accurately. One guide, although not very reliable, is to watch the small "tail-pieces" of the seeds, and when a fair percentage of these have fallen off the seed is generally ready for washing. One respect in which the fermentation of cucumber seed differs from the fermentation of tomato seed is that cucumber seed can be left in the solution up to a period of six days without being damaged.

The washing of the fermented seed is an easy matter, as the seed sinks to the bottom of the fermenting vessel and comes away very clean. It is only necessary to place the seed in a fine sieve and pour clean water over it. The

drying of the seed must be rapid if an unstained sample is desired. Spread the seed out in a thin layer on a sheet of canvas or hessian and keep constantly stirred until dry. Do not bag for a number of days as there is constant danger of the seed heating.

Working Costs and Yields.

Although only the surplus production of Messrs. Parry Bros.' crop was used for seed production, it was far superior in yield, and quality to the average crop grown in New South Wales. The yield of mature selected cucumbers was accurately estimated at 412 bushels per acre. It was found that about one gallon of juice and seeds was obtained from each bushel. The average yield of seed was 8·9 oz. per bushel, which was equal to 229 lb. 2 oz. per acre. The average yield in U.S.A. is only 180 lb. seed per acre, an exceptional crop being one that yields 200 lb. per acre. The seed gave a germination test of between 97 and 99 per cent., whereas only 70 per cent. is specified under the Agricultural Seeds Act.

Grower's Outfit for Saving Cucumber Seed.

The following costs were accurately kept with the object of obtaining some idea of the prospects of the industry in this State. No allowance has been made for depreciation on plant, cost of bagging, marketing, &c.

It was estimated that one man and a boy could harvest and prepare 56 bushels of cucumbers per day on rather steep country, with short drawings. One boy could clean and dry the seed to a safety point in half a day. The

seed must be constantly stirred until the surface moisture is evaporated, otherwise a dull sample will result. The cucumbers were valued at 3s. per bushel.

Cost of Treating 56 *bushels of Cucumbers.*

	£	s.	d.
56 bushels cucumbers @ 3s.	8	8	0
1 man @ 12s. per day	0	12	0
1 boy @ 5s. per day	0	5	0
1 boy (half-day drying seed)	0	2	6
	£9	7	6

Fifty-six bushels of cucumbers would yield approximately 31 lb. seed at a cost of 6s. per lb. The seed from which this crop was grown cost 11s. per lb. retail.

In U.S.A. the seed crop is handled much cheaper by machinery. There is no doubt it would pay growers who intend specialising in seed production to import a machine if the local seed trade could be secured. There are several types of machines available. The most popular is one in which the cucumbers are crushed between rollers and the resultant mass sieved in a rotary sieve to separate the juice and seeds from the pulp. The juice and seeds are then fermented as described.

"Bailliere's Encyclopaedia of Scientific Agriculture."

Something entirely new is presented in this latest encyclopaedia published (in two volumes) by Messrs. Bailliere, Tindall and Cox, London. The reader's acquaintance with the ordinary farm operations in regard to the subjects dealt with is assumed, the object of the present volumes being to describe as many as possible of the problems facing the farmer and then proceed to show how these have been or are being overcome by organised scientific research. It is true that the results of a vast amount of scientific work that has been accomplished are to be found in the many scientific journals devoted to agriculture, but this encyclopaedia aims at linking up those results with the practical side of agriculture and does not merely re-chronicle the findings of research workers.

Our copy of the work from the publishers.

"The Use of Fertilisers in Tropical and Sub-tropical Agriculture."

Messrs. Ernest Benn, Ltd., publishers, of London, have forwarded us a copy of Jacob and Coyle's book, *The Use of Fertilisers in Tropical and Sub-tropical Agriculture.* The book offers many useful suggestions on a very important side of tropical agriculture, and one on which there is a sparsity of information. The authors have been careful not to make the oft-repeated mistake of laying down definite recommendations for various crops under all conditions, but have suggested manurial treatments based on results of experiments carried out in different countries. The experiments are briefly summarised in the book.

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of the Poultry Expert.)

THIRTIETH YEAR'S RESULTS, 1931-32.

F. H. HARVEY, Organising Secretary.

THE thirtieth egg-laying competition at Hawkesbury Agricultural College commenced on 1st April, 1931, and terminated on 22nd March, 1932, a period of 357 days. The interval between 22nd and 31st March makes it possible to remove the birds from the pens and provide for the accommodation of entrants for the next test.

The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, the College Principal (Mr. E. A. Southee), Messrs. E. Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), C. Judson, D. R. Dove, and L. A. Ellis (competitors' representatives), and F. H. Harvey (Department of Agriculture), Organising Secretary.

Scope of the Competition.

The competition embraced two sections, was limited to pullets between seven and twelve months old on 1st April, 1931, and pens were allotted as follows:—

	Groups.	Birds.		Groups.	Birds.
Section A.			*Section B.*		
(Light Breeds).			(Heavy Breeds).		
White Leghorns	57	342	Black Orpingtons ...	24	144
			Langshans	7	42
			Rhode Island Reds ..	2	12

Weight of Eggs.

The regulation that hens must lay eggs at least 2 oz. in weight each within three months of the commencement of the test to be eligible for prizes resulted in the disqualification of twenty-three individual hens and two groups, as follows:—

Disqualified from Individual Prizes.

Light Breeds.—J. Cairney (No. 230), R. B. Dent (Nos. 284, 285), H. A. Duncan (No. 301), J. L. Flew (Nos. 319, 321), Hilder Bros. (No. 335), B. L. Blake (No. 344), F. G. Lombe (No. 376), Watson and Stepney (No. 500), A. C. Witten (No. 537).

Heavy Breeds.—A. W. Bower (No. 11), A. Greentree (No. 47), G. E. Holmes (No. 54), Mrs. C. E. Madrers (No. 83), H. Magull (No. 90), J. W. Smiles (No. 116), A. R. Wheatley (Nos. 139, 140, 141), P. Barrett (No. 153), G. Kellett (Nos. 158, 159).

Disqualified from Group Prizes.

Heavy Breeds.—A. R. Wheatley.

Light Breeds.—Hilder Bros.

The Financial Aspect.

The quantities of food consumed by the 540 birds were as follows :

Wheat	336 bushels 21 lb.		Salt	323 lb.
Maize	180 ,, 15 ,,		Shell grit ...	23 cwt.
Pollard	735 ,, 16 ,,		Green feed ...	81 cwt.
Bran	367 ,, 18 ,,		Epsom salts...	51 lb.
Meat meal	10 cwt. 44 ,,			

The cost of the foodstuffs (including freight and cartage), on the basis of ruling Sydney market prices, was £156 12s. 3d., equal to 5s. 9d. per head.

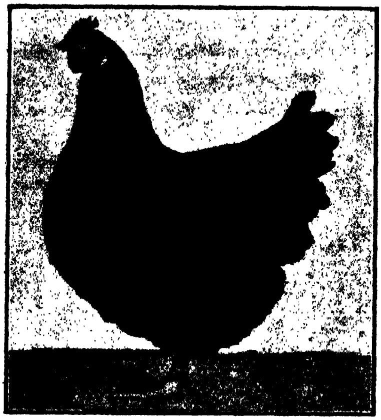
The value of eggs laid in the competition, calculated at Sydney ruling market prices for new laid eggs, less the usual pool contribution, freight and commission charges, was equal to an average net price of 1s. 0½d. per dozen.

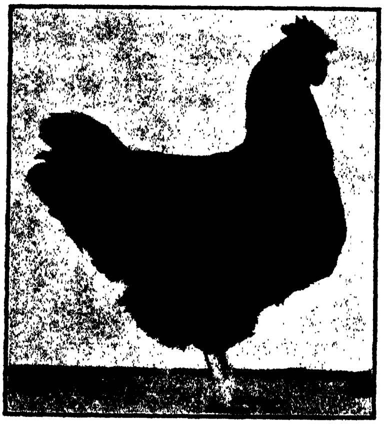
The Monthly Laying.

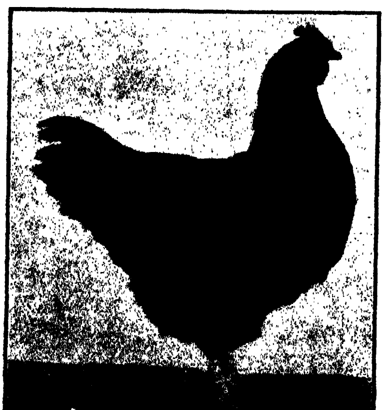
Month.		Section A (Light Breeds).		Section B (Heavy Breeds).		Total.
		Total for 342 hens.	Average per hen.	Total for 198 hens.	Average per hen.	
April,	1931	4,204	12·3	3,145	15·9	7,349
May	,, ...	5,418	15·8	3,458	17·5	8,876
June	,, ...	5,442	15·9	3,512	17·7	8,954
July	,, ...	6,480	18·9	4,101	20·7	10,581
August	,, ...	7,558	22·1	4,505	22·7	12,063
September	,, ...	7,572	22·1	4,191	21·2	11,763
October	,, ...	7,613	22·3	3,772	19·1	11,385
November	,, ...	6,978	20·4	3,236	16·3	10,214
December	,, ...	6,653	19·5	2,942	15·0	9,595
January	1932	6,005	17·6	2,531	12·8	8,536
February	,, ...	5,193	15·2	2,421	12·2	7,614
March	,, ...	3,327	9·7	1,655	8·3	4,982
Year 1931–32	...	72,443	211·8	39,469	199·4	111,912

Averages of Breeds.

No. of Birds	Breed.	Eggs per Hen.	Weight of Eggs per Dozen.	Value per Hen.
	Light Breeds.			
			oz.	£ s. d.
342	White Leghorn	212	25	0 17 11
	Heavy Breeds.			
144	Black Orpington	204	25	0 17 9
42	Langshan	189	25	0 16 4
12	Rhode Island Red	186	25	0 16 5

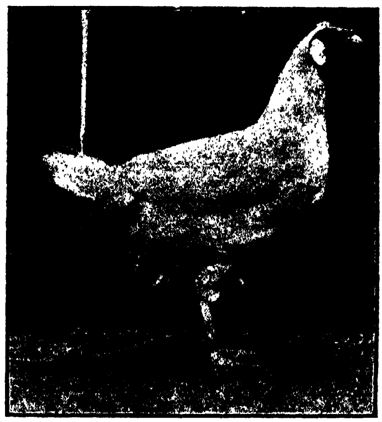






Three of Mr. H. Martindale's Black Orpingtons.

Winners of the Grand Championship Prize for greatest market value of eggs. This group also laid the greatest number of eggs (1,543) in the competition.



Three of Mr. A. A. Wesley's White Leghorns.

This group laid the greatest number of eggs (1,506) in the Light Breeds Section, and also won the Judson and Wimbleford Special Prize.

Monthly Laying of Individual Prize Winners.

The following table shows the monthly laying of winners of the individual prizes for highest scores :—

Owner.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Total.
						Heavy Breeds.							
C. Judson and Son ...	25	29	24	26	29	28	30	28	27	12	24	20	302
A. Sinclair	28	27	27	29	30	29	25	20	24	23	22	15	299
H. Martindale ...	26	27	30	29	31	27	26	22	24	23	22	11	298
A. Thompson ...	28	27	23	26	27	27	28	24	27	23	23	6	289
						Light Breeds.							
W. R. Oliver	24	25	26	24	28	25	23	26	25	25	21	16	288
H. J. Rose	22	24	22	24	27	27	24	27	27	26	21	16	287
W. R. Kingston ...	19	22	22	25	26	22	29	27	25	27	26	16	286
W. R. Kingston ...	22	26	25	25	26	24	26	28	25	20	22	16	285

Weights of Winning Birds.

The following are the weights at beginning and end of the competition of the birds laying the greatest number of eggs :—

		Weight at April, 1931.		Weight at March, 1932.	
Groups.		lb.	oz.	lb.	oz.
Heavy Breeds—					
H. Martindale's Black Orpingtons, Nos.	91	5	4	5	4
	92	5	2	5	8
	93	5	8	6	0
	94	5	4	6	4
	95	5	2	5	12
	96	5	10	7	0
Light Breeds—					
A. A. Wesley's, White Leghorns, Nos. ..	511	4	0	4	0
	512	4	0	4	12
	513	4	0	4	8
	514	3	14	4	12
	515	3	14	4	8
	516	3	8	4	4
Individual Hens.					
Heavy Breeds—					
C. Judson and Son's Black Orpington, No. 66...		5	0	5	4
Light Breeds—					
W. R. Oliver's White Leghorn, No. 421 ...		4	0	3	12

Mortality and Disease.

The casualties due to deaths and sickness totalled forty-four, as compared with forty in the previous year.

Particulars of the casualties in the various sections in the two years are as follows :—

	1930-31.		1931-32.	
	Light Breeds.	Heavy Breeds.	Light Breeds.	Heavy Breeds.
Birds replaced	13	3	10	3
Birds not replaced	14	10	17	14

Annual Competition.

Full details of the financial and other results since the inception of the competition are given in the following comparative table:—

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st	...	38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd	...	70	1,308	666	160	163	1/3¾	17/9	5/9¾	12/-
3rd	...	100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th	...	100	1,411	635	168	166	-/11½	13/3	5/3½	8/-
5th	...	100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th	...	60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th	...	50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th	...	60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th	...	40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th	...	50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th	...	50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th	...	50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th	...	63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th	...	70	1,449	506	165	192	1/4½	22/2	7/7	14/7
15th	A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¾
	B	30	1,479	749	165	192	1/3¾	21/7½	6/10	14/9½
	Total	70	......	...	...	206	1/3¾	25/8	6/10	18/10
16th	A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
	B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
	Total	70	......	...	...	206	1/4	21/6	7/8	13/10
17th	A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
	B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
	Total	70	......	...	...	195	1/5½	22/-	7/10	14/2
18th	A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
	B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
	C	3	1,304	977	138	195	1/10	27/8	9/3	18/5
	D	7	1,336	955	150	191	1/10	28/5	9/3	19/2
	Total	90	......	...	...	195	1/10	28/4	9/3	19/1
19th	A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
	B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
	C	5	1,425	944	148	195	2/2	36/-	12/8	23/4
	D	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
	Total	90	......	...	...	204	2/2	37/8	12/8	25/-
20th	A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
	B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
	C	5	1,092	885	144	168	1/11	24/7	11/9	12/10
	D	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
	Total	90	......	...	...	193	1/11	30/8	11/9	18/11
21st	A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
	B	30	1,417	720	164	188	1/9	27/5	10/10	16/7
	C	5	1,220	864	149	176	1/9	25/8	10/10	14/10
	D	5	1,212	931	144	187	1/9	27/3	10/10	16/5
	Total	90	......	...	...	191	1/9	27/10	10/10	17/-

EXPLANATORY NOTE.—A, Open Light Breeds; B, Open Heavy Breeds; C, Standard Light Breeds; D, Standard Heavy Breeds.

Annual Competition—*continued.*

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
22nd	A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
	B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
	C	5	1,307	692	142	170	1/6	21/1	9/9	11/4
	D	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-
	Total	90	......	..	...	205	1/6	25/11	9/9	16/2
23rd	A	57	1,470	961	160	212	1/8	28/7	9/11	18/8
	B	23	1,558	1,006	164	211	1/8	29/2	9/11	19/3
	C	5	1,291	950	146	180	1/8	23/5	9/11	13/6
	D	5	1,308	1,049	159	192	1/8	27/5	9/11	17/6
	Total	90	......	...	...	209	1/8	28/3	9/11	18/4
24th	A	50	1,444	803	158	206	1/6	26/5	10/-	16/5
	B	30	1,466	916	171	199	1/6	26/4	10/-	16/4
	C	5	1,248	881	136	187	1/6	25/-	10/-	15/-
	D	5	1,331	777	151	186	1/6	24/7	10/-	14/7
	Total	90	......	...	...	201	1/6	26/2	10/-	16/2
25th	A	51	1,531	797	162	209	1/8½	29/4	11/-	18/4
	B	29	1,519	753	161	204	1/8½	29/2	11/-	18/2
	C	5	1,319	1,092	147	173	1/8½	23/8	11/-	12/8
	D	5	1,326	842	155	203	1/8½	28/9	11/-	17/9
	Total	90	.....	...	...	205	1/8½	28/11	11/-	17/4
26th	A	50	1,505	885	162	205	1/10	30/9	9/7	21/2
	B	30	1,467	1,005	165	207	1/10	31/11	9/7	22/4
	C	5	1,234	790	138	168	1/10	24/1	9/7	14/6
	D	5	1,339	1,029	149	192	1/10	30/-	9/7	20/5
	Total	90	.....	...	...	203	1/10	30/9	9/7	21/2
27th	A	55	1,531	868	173	201	1/9½	30/2	8/7	21/7
	B	25	1,386	954	163	201	1/9½	30/11	8/7	22/4
	C	5	1,302	914	147	177	1/9½	26/6	8/7	17/11
	D	5	1,259	883	155	176	1/9½	26/1	8/7	17/6
	Total	90	......	...	...	198	1/9½	29/11	8/7	21/4
28th	A	55	1,496	891	161	206	1/6	25/1	9/10	15/3
	B	25	1,544	931	165	212	1/6	26/11	9/10	17/1
	C	5	1,319	1,190	151	211	1/6	25/11	9/10	16/1
	D	5	1,239	968	160	196	1/6	23/10	9/10	14/0
	Total	90	......	...	...	207	1/6	25/7	9/10	15/9
29th	A	55	1,520	790	158	202	1/3½	20/5	7/3	13/2
	B	25	1,443	925	167	198	1/3½	21/6	7/3	14/3
	C	6	1,280	1,001	146	192	1/3½	19/5	7/3	12/2
	D	4	1,260	1,099	147	198	1/3½	20/8	7/3	13/5
	Total	90	.....	..	...	200	1/3½	21/2	7/3	13/11
30th	A	57	1,506	998	156	212	1/0½	17/11	5/9	12/2
	B	33	1,543	762	166	199	1/0½	17/4	5/9	11/7
	Total	90	......	...	...	207	1/0½	17/8	5/9	11/11

EXPLANATORY NOTE.—A, Open Light Breeds; B, Open Heavy Breeds; C, Standard Light Breeds; D, Standard Heavy Breeds.

PRIZE LIST.*

* For all prizes it was required that individuals in groups must lay eggs not less than 2 oz. in weight.

GRAND CHAMPION PRIZE (VALUE, £10 10s.).

For group of six birds (without replacement) laying eggs of greatest market value.—H. Martindale (Black Orpingtons), market value £6 18s. 1d.

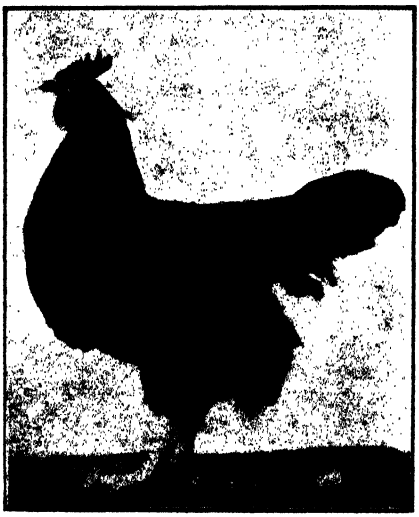
GOLDEN EGG OF 1932 (VALUE, £25).

Donated by the Metropolitan Meat Industry Board for groups of six birds completing the competition; points to be awarded for number, quality and market value of eggs, also standard quality of birds.—J. J. Wilson, (Rhode Island Reds), 55 points.

SPECIAL PRIZES.

GOLDEN EGG CONSOLATION (Value £10 10s.).—Donated by Metropolitan Meat Industry Board for leading group in the division opposite to that gaining the "Golden Egg," judged on the same scale of points.—H. L. Abrook (White Leghorns), 53 points.

JUDSON AND WIMBLEFORD.—Special prizes of £3 3s. each (donated by Messrs. C. Judson and Son and F. T. Wimble) for heavy and light breeds respectively (their own entries to be ineligible), for groups laying a minimum of 1,350 eggs, and scoring the most points on the following scale:—Each bird laying 250 eggs or over, 3 points; each bird laying 240-249 eggs or over, 2 points; each bird laying 225-239 eggs or over, 1 point.—H. Martindale (Black Orpingtons), 15 points; A. A. Wesley (White Leghorns), 15 points.



Messrs. C. Judson and Son's Black Orpington.

Winner of the prize for the greatest number of eggs (302) in the Heavy Breeds Section. This bird laid the greatest number of eggs in the competition.

Mr. W. R. Oliver's White Leghorn.

Winner of the prize for greatest number of eggs (288) in the Light Breeds Section.

THE WIMBLEFORD THOUSAND (first prize £2 2s., second £1 1s.) donated by Mr. F. T. Wimble for the first and second groups of White Leghorns to lay 1,000 eggs (his own entry to be ineligible).—A. A. Wesley, 16th November, £2 2s.; R. A. Jacobs, 19th November, £1 1s.

HADLINGTON COMMEMORATION MEDAL (donated by Mr. W. H. Paine to commemorate the services of Mr. James Hadlington, late Government Poultry Expert).—To be awarded on points scored for type and breed characteristics, weight of birds and weight of eggs, with minimum score of 1,100.—J. J. Wilson (Rhode Island Reds), 62 points.

"POULTRY" NEWSPAPER SPECIAL, value £3 3s. (donated by "Poultry" Newspaper) for the individual hen which first lays 200 eggs during the competition.—H. Martindale (Black Orpington No. 91), 200th egg on the 208th day of competition (25th October).

THE PRODUCERS' CO-OPERATIVE DISTRIBUTING SOCIETY, value £2 2s. (donated by the Society), for individual hen laying greatest score without a break.—S. Nicholls (Langshan No. 173), laid 105 eggs from 15th July to 27th October.

THE W. M. MULLINER SPECIAL, value £2 2s.—Awarded to groups wherein each bird lays eggs weighing between25 and 28oz. per dozen, with minimum score of 1,100.—A. Thompson (Black Orpington), 1,329 eggs; individual egg weights 25, 26, 25, 26, 26, 25 ounces.

QUALITY PRIZES.

Open to groups selected for standard type, with minimum score of 1,200 eggs,

Heavy Breeds.—J. J. Wilson (Rhode Island Reds), 1,289 eggs, £5; C. Judson and Son (Black Orpingtons), 1,252 eggs, £2 10s.

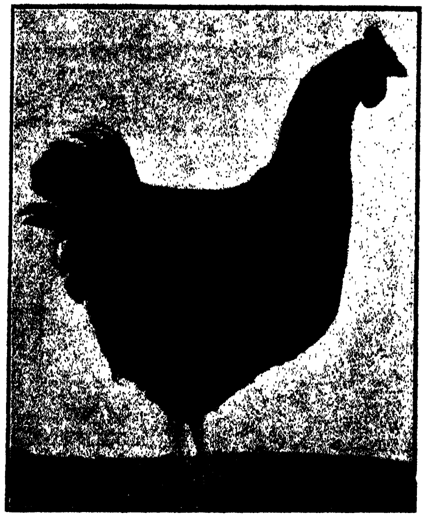
Light Breeds.—H. L. Abrook (White Leghorns), 1,407 eggs, £5; R. Thoroughgood (White Leghorns), 1,393 eggs, £2 10s.

HIGHEST GROUP SCORES.

Heavy Breeds.—H. Martindale (Black Orpingtons), 1,543 eggs, £3; W. Tennent (Black Orpingtons), 1,493 eggs, £2 10s.; S. Nicholls (Langshans), 1,453 eggs, £2; Mrs. V. E. Cox (Black Orpingtons), 1,343 eggs, £1 10s.; J. Cairney* (Black Orpingtons), 1,329 eggs, £1.

One of Mr. H. L. Abrook's White Leghorn.

The group on the Golden Egg Consolation Prize.



A Bird from Mr. J. J. Wilson's Pen of Rhode Island Reds.

This group won the Golden Egg of 1932, and also the Hadlington Commemoration Medal.

Light Breeds.—A. A. Wesley (White Leghorns), 1,506 eggs, £3; H. J. Rose (White Leghorns), 1,499 eggs, £2 10s.; R. A. Jacobs (White Leghorns), 1,428 eggs, £2; A. E. Passlow (White Leghorns), 1,417 eggs, £1 10s.; H. L. Abrook (White Leghorns), 1,407 eggs, £1.

HIGHEST INDIVIDUAL SCORES.

Heavy Breeds.—C. Judson and Son (Black Orpington), 302 eggs, £2 10s.; A. Sinclair (Black Orpington), 299 eggs, £2; H. Martindale (Black Orpington), 298 eggs, £1 10s.; A. Thompson (Black Orpington), 289 eggs, £1.

Light Breeds.—W. R. Oliver (White Leghorns), 288 eggs, £2 10s.; H. J. Rose (White Leghorn), 287 eggs, £2; W. R. Kingston (White Leghorn), 286 eggs, £1 10s.; W. R. Kingston (White Leghorn), 285 eggs, £1.

QUARTERLY (GROUP) PRIZES.

Winter Test (1st April to 30th June, 1931).

Heavy Breeds.—H. Martindale, 460 eggs, £2; A. Thompson, 406 eggs, £1 10s.
Light Breeds.—R. A. Jacobs, 375 eggs, £2; G. N. Mann, 356 eggs, £1 10s.

* A. Thompson's team also laid 1,329 eggs, but in terms of Rule 22 the prize was awarded on market value (J. Cairney, £5 17s. 4d.; A. Thompson, £5 15s. 11d.).

Spring Test (1st July to 30th September, 1931).

Heavy Breeds.—H. Martindale, 482 eggs, £1 10s.; A. Thompson, 454 eggs, £1.
Light Breeds.—A. A. Wesley, 444 eggs, £1 10s.; Morgan and Williams, 417 eggs, £1.

Summer Test (1st October to 31st December, 1931).

Heavy Breeds.—W. Tennent, 398 eggs, £1 10s.; S. Nicholls, 372 eggs, £1.
Light Breeds.—A. A. Wesley, 444 eggs, £1 10s.; J. Jefferson, 434 eggs, £1.

Autumn Test (1st January to 22nd March, 1932).

Heavy Breeds.—W. Tennent, 310 eggs, £2; S. Nicholls, 267 eggs, £1 10s.
Light Breeds.—R. Thoroughgood, 333 eggs, £2; H. J. Rose, 323 eggs, £1 10s.

Individual and Group Egg Yields.

Egg-yield of Each Bird and Group in the Thirtieth Annual Competition.

Owner and Breed.	Individual Score.						Totals of Groups.	Weight of Eggs per dozen.	Market Value.		
Heavy Breeds.								oz.	£	s.	d.
H. Martindale: Black Orpingtons.	274	250	298	274	259	179	1,543	24·5	6	18	1
W. Tennent: Black Orpingtons.	191	284	252	268	237	261	1,493	25·0	6	8	11
S. Nicholls: Langshans ...	196	229	252	245	277	254	1,453	25·5	6	7	0
Mrs. V. E. Cox: Black Orpingtons.	239	202	263	194	250	195	1,343	24·6	5	18	0
John Cairney: Black Orpingtons.	254	234	215	189	197	240	1,329	24·8	5	17	4
A. Thompson: Black Orpingtons.	163	241	*205	†190	289	241	1,329	25·5	5	15	11
W. A. Williams (S.T.P.F.): Langshans.	217	208	210	239	215	212	1,301	25·0	5	13	11
J. J. Wilson: Rhode Island Reds.	166	236	238	225	210	214	1,289	25·5	5	13	9
C. Judson and Son: Black Orpingtons.	243	232	†136	116	223	302	1,252	25·3	5	8	1
A. Sinclair: Black Orpingtons	240	212	56	166	275	299	1,248	24·8	5	9	9
A. H. Moxey: Black Orpingtons.	270	196	284	†116	217	†160	1,243	25·5	5	7	1
F. C. Nicholls: Langshans ...	225	226	217	158	212	203	1,241	25·6	5	4	3
Madden and Smith: Black Orpingtons.	187	257	221	202	174	197	1,238	25·3	5	9	9
W. Clayton: Black Orpingtons	80	219	252	276	196	209	1,232	24·5	5	7	4
S. Lidden: Black Orpingtons	274	147	198	243	161	192	1,215	24·8	5	5	2
B. S. Upton: Black Orpingtons.	198	198	234	180	224	157	1,191	24·5	5	2	0
B. Becroft: Langshans ...	196	131	†141	258	242	133	1,101	25·3	4	18	6
G. Bennett: Black Orpingtons	180	238	159	123	175	191	1,066	25·3	4	19	0
R. Bray: Black Orpingtons ...	255	127	*105	†111	210	250	1,058	24·5	4	16	9
M. and H. Williamson: Black Orpingtons.	†109	212	144	202	169	173	1,000	25·2	4	3	8
E. J. Whalan: Langshans ...	127	191	152	184	148	204	1,006	25·0	4	9	9
C. E. Messervy: Rhode Island Reds.	184	145	163	142	202	†105	941	24·6	4	3	2
C. W. Gee: Black Orpingtons	162	189	†136	167	†54	224	932	24·5	3	18	1
C. B. Knight: Black Orpingtons.	124	188	†49	*145	†62	194	762	25·0	3	4	0
J. W. Smiles: Black Orpingtons.	272	†‡	242	277	204	267	...	24·2	6	11	3
A. Greentree: Black Orpingtons.	244	250	282	285	‡	191	...	24·5	6	2	4
G. E. Holmes: Black Orpingtons.	194	158	282	238	249	‡	...	24·3	6	0	7
P. A. Barrett: Langshans ...	236	160	‡	255	155	178	...	25·2	4	5	1
H. Magull: Black Orpingtons	162	225	118	223	255	‡	...	24·3	4	13	4
Mrs. C. E. Madrers: Black Orpingtons.	212	207	230	17	‡	265	...	24·3	4	19	6
A. W. Bower: Black Orpingtons.	27	253	209	203	‡	143	...	24·5	4	1	6
G. Kellett: Langshans ...	151	‡	‡	103	150	121	...	24·8	3	8	2
A. R. Wheatley: Black Orpingtons.	‡	†‡	‡	278	221	271	§	23·2	5	5	5

Owner and Breed.	Individual Score.						Totals of Groups.	Weight of Eggs per dozen.	Market Value.		
			Light Breeds. ‖					oz.	£	s.	d.
A. A. Wesley	254	258	270	244	250	230	1,506	25·3	6	8	0
H. J. Rose	287	228	247	242	279	216	1,499	24·5	6	7	9
R. A. Jacobs	236	178	265	282	245	222	1,428	25·5	6	4	10
A. E. Passlow	203	246	241	272	246	209	1,417	25·2	6	1	5
H. L. Abrook	240	226	246	210	237	248	1,407	24·6	5	19	3
R. Thoroughgood	238	180	254	274	201	246	1,393	24·8	5	15	9
W. C. Hardy	236	201	244	204	244	261	1,390	24·8	5	17	2
J. Richings	233	257	245	240	196	212	1,383	25·0	5	17	3
G. N. Mann	255	251	237	256	248	*131	1,378	25·2	5	16	5
S. E. Daley	205	231	239	181	229	265	1,350	25·0	5	12	4
F. T. Wimble	150	255	192	232	265	252	1,346	25·5	5	11	9
W. I. Williams	253	197	252	273	248	114	1,337	24·8	5	14	11
Davies and Webb	243	252	143	243	260	192	1,333	24·8	5	14	8
Neal Bros.	192	257	208	238	234	200	1,320	25·0	5	13	3
V. C. Tunnicliffe	218	119	243	248	250	247	1,325	24·8	5	16	6
J. Cornwell	216	218	263	187	†202	235	1,321	24·3	5	10	8
Morgan and Williams... ...	154	230	269	223	242	203	1,321	25·3	5	9	7
L. A. Ellis	242	†151	190	234	255	246	1,318	25·3	5	11	0
H. Holmes	†120	224	236	259	245	227	1,311	25·5	5	13	1
K. R. Slade	*204	221	213	235	176	250	1,299	24·2	5	5	9
H. P. Toop	242	209	219	235	217	176	1,298	25·2	5	7	11
K. G. Cobcroft	263	242	174	223	138	246	1,286	24·8	5	8	6
F. A. Bailey	203	203	189	217	267	*198	1,277	25·3	5	5	3
J. Oates	264	197	231	145	246	189	1,272	25·0	5	7	0
H. R. Nelson	249	239	228	231	112	196	1,255	25·3	5	6	0
P. O. Ranch	257	†120	274	224	144	236	1,255	25·0	5	6	6
R. Whitelaw, junior	257	211	160	227	176	224	1,255	25·3	5	4	4
S. J. Evans and Son	254	216	140	230	202	212	1,254	25·3	5	5	4
J. Bradford and Son	214	168	†222	232	214	193	1,243	25·5	5	3	5
A. Biden	259	257	*94	187	227	214	1,238	24·6	4	15	0
W. R. Oliver	288	108	237	*129	204	264	1,230	24·5	5	5	4
J. Jefferson	257	*121	229	224	168	220	1,219	25·5	4	16	11
W. J. Scarboro	236	235	129	107	182	228	1,207	25·3	4	19	10
W. S. Cartwright	*72	265	236	226	236	163	1,198	25·2	5	2	9
W. R. Kingston	285	286	†90	228	56	250	1,195	25·6	5	5	10
B. Clarke	199	219	263	225	198	89	1,193	24·6	4	17	9
J. Donsworth	219	180	209	254	251	78	1,191	24·6	5	2	0
D. R. Dove	164	†117	244	232	224	192	1,173	25·5	4	19	3
J. W. Tayler	231	176	253	202	107	195	1,164	25·0	4	17	0
H. P. Christie	181	217	148	211	163	236	1,156	24·2	4	11	3
F. T. Turner	218	230	†165	181	181	178	1,153	25·5	4	17	6
E. Watts	150	230	247	96	188	240	1,151	24·6	4	12	6
W. H. Rogers	184	219	234	172	173	156	1,138	25·2	4	10	9
I. Lowery	173	269	†50	107	267	250	1,116	24·3	5	0	5
T. McDonald	216	*152	189	236	†58	238	1,089	24·8	4	16	5
H. and W. Bailey	221	233	*152	189	†158	125	1,078	24·5	4	11	4
C. Leach & Sons	177	209	264	†137	†101	148	1,036	24·6	4	7	8
R. G. Christie & Son	†160	160	200	152	174	152	998	24·8	4	7	9
Watson and Stepney	279	‡	247	278	261	263	...	24·3	6	9	9
B. L. Blake	241	‡	244	221	232	282	..	24·6	6	2	7
F. G. Lombe	228	209	159	‡	220	280	...	25·0	5	8	7
J. Cairney	174	‡	173	249	242	230	...	24·3	5	8	6
A. C. Witten	245	†119	†	105	246	239	...	24·5	5	9	9
J. L. Flew	‡	174	‡	236	221	262	...	24·2	5	9	10
R. B. Dent	209	†	‡	159	190	210	...	24·2	4	8	10
H. A. Duncan	‡	165	263	137	*62	*145	...	24·6	3	15	11
Hilder Bros.	192	215	203	219	‡	200	§	23·8	4	19	8

* Signifies bird replaced; original score struck out.
† Signifies bird dead; score retained.
‡ Signifies that the eggs are under the standard weight of 24 oz. per dozen; ineligible for prizes.
§ Signifies team average is also under 24 oz. per dozen.
‖ Only White Leghorns competed in this section.

COMMENTS BY THE POULTRY EXPERT.

Although it is thirty years since the laying contests at the Hawkesbury Agricultural College were commenced, interest in the results appears to be just as keen as ever, and the educational value of the tests is very considerable on account of the constant striving of the competitors to select birds which

will put up high records. In this connection it is interesting to note that while several breeders have been consistent in choosing teams which have either won the main prizes or have been close up to the winning groups, yet none has so far been able to establish a strain of high layers which will produce their like in any appreciable numbers. This is shown by the fact that the general average in these tests has not materially increased during the past fifteen years. In the 1916-17 test the average was 206, which was fourteen eggs per bird higher than any previous year, and followed the institution of the minimum weight standards for birds entering the competition in the previous year.

Production Comparisons.

This year the general average of egg production shows an improvement of seven eggs over last year, the number being 207 for the test just concluded. This figure has only been exceeded once, and that was in the year 1924-25, when the average was 209.

The average for the light breeds (White Leghorns) was 211·7, compared with 199·3 for heavy breeds. The average for the light breeds has only been exceeded twice during the currency of these tests, with 212 in 1924-25 and 216 in 1916-17.

Weight of Eggs.

It is pleasing to note that the number of individual birds laying under-weight eggs was seven lower than in the previous test, there being only twenty-three, or a little over 4 per cent. of the total number of birds in the test, and only two groups averaged less than 24 ounces per dozen compared with four last year. Despite this, however, there was only a slight increase in the average weight of eggs in the light breeds, the figures being 24·9 oz. per dozen this year in comparison with 24·5 oz. last year. In the Black Orpingtons there was a reduction in weight, as the average works out at 24·8 oz. as against 25 oz. last year.

Langshans lead in egg weight with 25·2 oz., followed by Rhode Island Reds (only two pens), which averaged 25 oz.

How to Improve Size of Eggs.

There has been a gradual falling away in the average weight of eggs during recent years, and, owing to the important economic aspect of the matter, commercial poultry-farmers should concentrate on endeavouring to effect some improvement. The main factors to consider in this connection are the physique of birds used for breeders, and the rigid elimination for incubation of eggs which do not come up to the 2 oz. standard. Care should also be taken to breed only from male birds which are bred from pens laying full-size eggs. Another aspect which should not be overlooked is that pullets which do not lay full-weight eggs by the time they are nearly twelve months old should not be used in the breeding pens the following year.

The Financial Aspect.

Although the cost of feeding is the lowest since 1913–14, the average price of eggs has not been as low since 1906–7, when the price was the same as in this test, viz., 1s. 0½d. per dozen. This is a serious matter for the poultry farmer, as it means that when worked out on a twelve-dozen flock average production per hen, the return to the farmer would be only 6s. 9d. per hen over the cost of feed. This position can only be met by reducing costs in every possible way, both on the farm and at the marketing end.

Cold Storage Eggs Absorb Odours.

Cold storage warehousemen who handle eggs have been warned by the U.S.A. Department of Commerce that care should be taken to prevent eggs from coming in contact with fruits or other commodities which emit odours. The Department said its attention had been called to a number of shipments of eggs which, exported recently to Great Britain, were found to have become tainted because they were stored too near shipments of fruit. The odour of citrus fruits and apples have been found to penetrate the shell and be taken up by the yolk. Although the eggs are not actually spoiled, suspicions are created in the minds of purchasers because they smell and taste unlike fresh eggs.

The Type of Plough to Use.

There is much controversy among wheat-farmers as to whether the mouldboard or the disc plough is the better implement to use when ploughing the fallow. No hard-and-fast rule can be laid down, and the farmer must be guided to a large extent by the class of soil he has to handle and the condition it is in when making a choice between the two implements. This problem and many others connected with wheat farming are thrashed out in *The Farmers' Handbook,* which contains a very complete section on wheat culture. In addition, this book deals thoroughly with all crops of importance, grasses and pastures, silos and silage, the feeding of farm stock, weeds, blacksmithing, tank-making, carpentry, painting, farm buildings, fences and fencing, manures and fertilisers, book-keeping for farming, and numerous other subjects of interest to farmers.

The book contains 1,028 pages, numerous illustrations, and is strongly bound. Price, 11s. 6d., including postage, from the Department of Agriculture, Box 36A, G.P.O., Sydney.

Cowra District Unsuitable for Canning Beans.

Field trials with canning beans have been carried out at Cowra Experiment Farm by the Experimentalist, Mr. A. Pearson, during the past two years, but with so little success that it has been decided to discontinue the trials. Apparently this crop cannot withstand the hot dry summer conditions of the Cowra district, as in both years the plants were burned off as they reached maturity after making very satisfactory early growth.

Poultry Notes.

May.

E. HADLINGTON, Poultry Expert.

As preparation for the breeding season will require to be finalised during this month, it is perhaps well to visualise what the near future holds for the industry and make plans accordingly. The figures recently published giving the cost of feeding and average price of eggs in the Hawkesbury Agricultural College laying competition for the year ending 31st March, 1932, show that on a twelve dozen per hen average egg production per annum the return to the farmer over cost of feed was only 6s. 9d. compared with 8s. 3d. per hen the previous year. Although the cost of feeding was the lowest for eighteen years, being 5s. 9d. per hen, the average net price of eggs was only 1s. 0½d. per dozen, to equal which we have to go back twenty-five years. The question then which naturally arises is what are the prospects for the current year. In this connection there appears little hope of any improvement, present indications pointing on the contrary to a somewhat lower average price for eggs, and there is every possibility of an increase in the cost of feeding.

Factors Affecting the Situation.

The problem which, therefore, confronts the poultry farmer is how best to meet the situation. The first consideration is whether an attempt should be made to increase the flocks to bring about a larger income. This can only be determined by the individual according to his circumstances, and will depend, for instance, on whether facilities are available to properly rear additional pullets and whether the rearing of the extra birds can be financed up to the time they come into payable production, for it has to be remembered that every pullet reared in excess of the normal number required for replacements means a reduction of income until she becomes self-supporting. Owing to the reduced earning power of existing flocks, therefore, it may not be possible materially to augment present numbers. In many cases, because of limited equipment for rearing, it may be found more profitable not to attempt to rear as many chickens as usual. On such farms, it is folly to endeavour to put through more chickens than can be properly handled, as the result is usually a higher rate of mortality, together with lack of development, and in the end probably a smaller number of pullets than would have been reared by keeping within safe limits. Moreover, badly reared birds will not pay as well as those which are given good conditions.

One of the mistakes commonly made by poultry farmers, especially beginners, is to purchase or hatch at one time more chickens than can be safely accommodated after they are a few weeks old. This is done through basing the capacity of the brooding plant on baby chicks instead of on birds at about six weeks of age, when they would be leaving the brooders.

Thus if brooder space is available for accommodating, say, 500 chicks at a day old, this number would require to be reduced to about half by the time they were six weeks old to avoid overcrowding, which is one of the greatest evils in chicken rearing.

How to Grow Profitable Birds.

If poultry farmers would concentrate more on providing efficient equipment for rearing the chickens through all stages to maturity, and pay more attention to a few simple yet important principles of chicken raising, they would rear more robust birds, which would return greater profits. Among such principles are provision of sufficient heat to prevent packing in the brooders and yet allow ample ventilation, protection from exposure to cold weather, feeding of a simple balanced ration, avoidance of overcrowding at any stage, and allowance of as much range as possible, particularly after ten to twelve weeks of age.

On numerous farms large sums of money are expended on the latest in houses for layers, yet more or less primitive methods are adopted for rearing the chickens, the losses among which soon amount to the cost of suitable rearing plant. It would be far more profitable to provide satisfactory rearing equipment and reduce, if necessary, the expenditure upon housing the layers.

Study Cost of Feeding.

The lean time through which the poultry industry is passing can be attributed mainly to the low prices of poultry products, and the reasons for low prices are outside the control of the commercial poultry farmer, but the fact that returns are lower must be faced and every avenue explored to reduce costs on the farm in order to make the best of the situation. A substantial saving might be effected on many farms in the feed account by eliminating some of the little extras which are often added with a pious hope that they will work magic in egg production. These are mostly items which add considerably to the cost without producing the desired result, and while in some cases increased yields appear to follow from the use of some new ingredient, this could only be proved by carefully conducted experiments, which would not be possible on the average poultry farm. In view of this, poultry farmers would be well advised to follow along the "beaten path" in the matter of feeding.

The results in the Hawkesbury Agricultural College laying competition show that during the past ten years the average production has been 203 eggs per hen, while numerous individual birds have laid over 300 eggs. As far as is known this average has not been equalled in any country where extensive laying tests are carried out, and although these birds are selected from ninety competitors' farms, it must be acknowledged that unless the ration fed was satisfactory such results could not be obtained. As many farmers are aware, the ration used is of the simplest composition and has not been varied during the period under review, for the sufficient reason that no more effective ration has been found. For the benefit of those who

are not familiar with the composition of the ration, particulars are given below: —

To make 100 lb. of Morning Mash.		*Evening Ration of Grain.*
Pollard	60 lb.	Two-thirds wheat.
Bran	34 lb.	One-third crushed maize.
M.I.B. Meat meal... ...	6 lb.	
	100 lb.	

This mash can be used dry if desired. When used as a wet mash, 22 oz. of common salt should be dissolved in the liquid with which the mash is mixed.

When used as a dry mash, it should be fed in hoppers. In the dry mixture only half the quantity of salt should be used, and great care should be exercised to see that it is evenly distributed. The hoppers should be filled every week.

Anyone making a change, however, should do so gradually owing to the risk of putting the birds off laying.

Effecting Other Savings.

In many cases a good deal of wastage of food occurs through faulty dry feed hoppers which allow the birds to scratch out the food, and while this is often not noticed, the loss is fairly considerable in the course of a year. It may be mentioned for the benefit of those who are having trouble in this respect that plans of a suitable type of hopper are obtainable on loan from the Department.

On farms where wet mash is fed there is also often much loss of food due to not providing troughs in which to give the feed, yet it is a simple matter to construct wooden troughs by nailing at right angles two boards forming a V-shaped trough, on one end of which is fixed another board to make the trough stand in position.

Rice Pollard.

At the present time rice pollard is available in fairly large quantities at rates somewhat cheaper than wheaten pollard (approximately £3 10s. per ton), and its analysis would indicate that it is a suitable substitute for at least portion of the wheaten pollard. A preliminary feeding trial over two months has recently been carried out at the Government Poultry Farm, Seven Hills, using rice pollard as an entire substitute for wheaten pollard, and although the change was made over a period of only a fortnight, the results showed practically no difference in production or health of the birds. Particulars of the trial are given below:—

	No. of Eggs, January.	No. of Eggs, February.	Total.	Grand Total, two pens.
	Rice Pollard Substituted for Wheaten Pollard.			
Pen 1 (10 hens) ...	174	119	293	558 eggs.
Pen 2 (10 hens) ...	170	95	265	
	Check Pens (Ordinary Ration).			
Pen 3 (10 hens) ...	167	110	277	573 eggs.
Pen 4 (10 hens) ...	186	110	296	

While the results of this short test cannot be regarded as definite proof that rice pollard is equal to wheaten pollard, they indicate that it is not likely to seriously affect egg production, and while prices remain at present levels its use would tend to reduce cost of feeding to some extent. However, a greatly increased demand for rice pollard would, no doubt, result in an increased price.

Don't Underfeed.

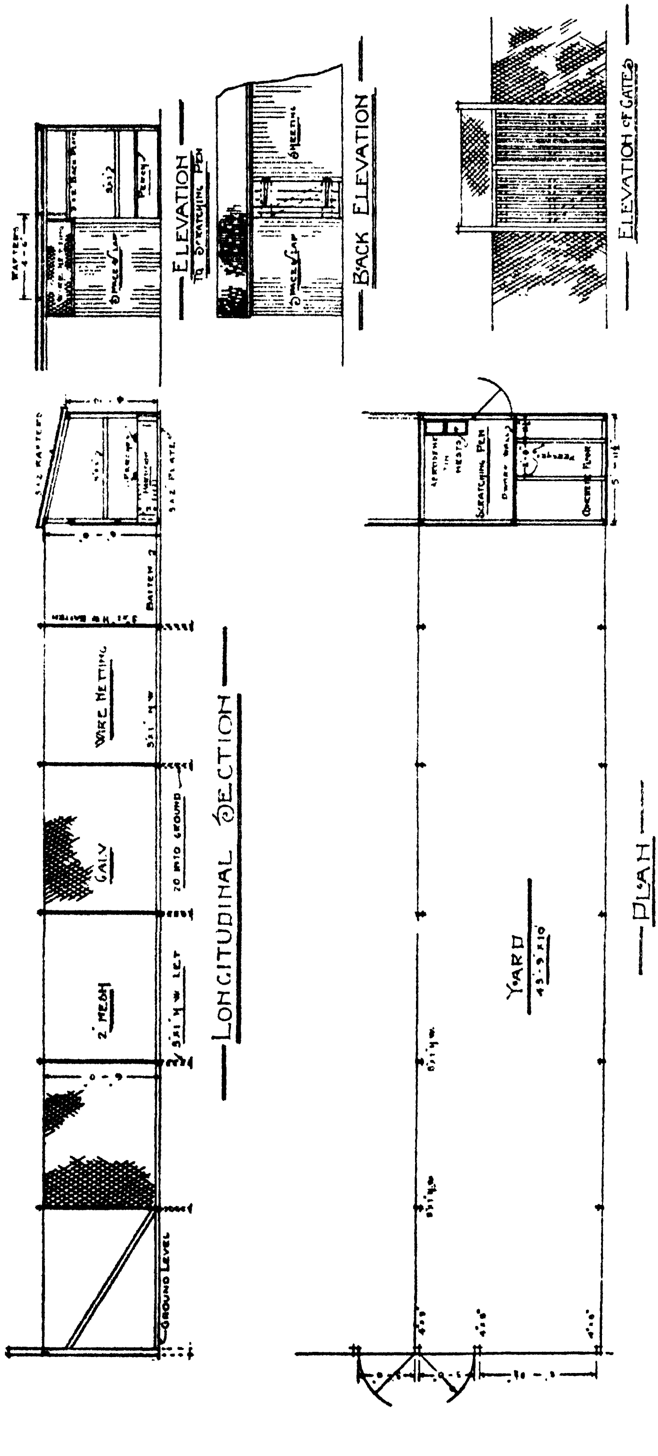
Many inexperienced poultry farmers make the mistake of attempting to lower the cost of feeding at this time of the year when production is at its lowest by reducing the amount of feed given to the birds because they are not paying for the cost of food. This practice, however, only makes matters worse and prolongs the unproductive period to a greater or lesser extent according to how much the feed supply is curtailed. Naturally when the birds are moulting they will not eat as much as when in full lay, and allowance must be made accordingly, but the birds should nevertheless be given just as much as they will eat in a little over half an hour at each meal. Any attempt at curtailing the feed to save costs is false economy, because the birds use up any reserves of fat, which have to be replaced before production is commenced again.

View of Poultry Breeding Pens.

Housing Breeding Stock.

In response to inquiries regarding suitable breeding pens, particulars are given hereunder of the type of pens which are in use on Departmental farms and which are found quite satisfactory.

These pens are so constructed that one-half is used for scratching litter in which the birds are fed at night, and the nests are also fitted in this portion. The other half is open in the front and is for the roosting section. This part could be enclosed with wire netting and have a door fitted for convenience in catching the birds, or to facilitate feeding the male bird by himself at mid-day. The yards are built with 3 in. x 1 in. hardwood battens except for corner and gate posts, which are of 4 in. x 3 in. or 4 in.



Plan of Breeding Pens

x 2 in. hardwood. The 3 in. x 1 in. posts are 8 feet long, and at the bottom have another piece of 3 in. x 1 in. batten 2 feet long nailed on to make them 3 in. x 2 in. in the ground. They are placed 8 feet apart and 20 inches in the ground, leaving 6 ft. 4 in. out of the ground, which allows a few inches above the netting for taking up any sagging of the wire later on.

There is no necessity for fencing wire along the top of the fences if the netting is put on properly. The correct way to erect the netting is first to run out the roll on the ground, when it will be seen that one edge is shorter than the other. The short edge should be put at the top of the posts so as to form a straight line; any bulges in the netting can be taken out by crimping a few of the meshes with a pair of pliers. The gates shown in the illustrations are constructed with 2 in. x 1 in. battens, but for these can be substituted 1 inch mesh wire netting of 18 gauge, as provided for in the quantities of materials hereunder. These quantities are worked out for five pens—a suitable number for an average farm of 800 to 900 layers.

MATERIALS REQUIRED FOR THE CONSTRUCTION OF FIVE BREEDING PENS.

Dimensions of Each House.		*Yards.*	
Length	10 feet.	Length	40 feet.
Width	6 ,,	Width	10 ,,
Height (back)	5 ,,		
Height (front)	6 ,,		

Materials for Houses.	Total Quantities.
3″ x 2″ H.W. 10/10′, 2/6′ for bottom plates	56 feet super.
3″ x 2″ Oregon 10/10′ for top plates	50 ,, ,,
3″ x 2″ Oregon 11/11′ (to cut), 2/10′, 1/5′ (to cut) for studs	73 ,, ,,
3″ x 2″ Oregon 6/14′ (to cut) for rafters	42 ,, ,,
3″ x 1″ Oregon 150′ lineal, for battens	38 ,, ,,
3″ x 1″ Oregon 250′ lineal, for rails for divisions, and for securing palings and perch supports	63 ,, ,,
3″ x 1″ H.W. 5/10′ for perches	13 ,, ,,
12″ x 1″ Oregon 5/6′, for dwarf walls	30 ,, ,,
H.W. palings 300/5′, for back and front.	
H.W. palings 150/6′ for ends and divisions.	
6″ x 1″ T. & G. Baltic or Oregon 10/10′, 5/8′, for ledge doors and braces	70 ,, ,,
4″ x 3″ H.W. 2/17′, 1/19′, for corner and front division posts	53 ,, ,,
3″ x 2″ H.W. 5/10′, for gate posts	25 ,, ,,
3″ x 1″ H.W. 24/8′, for full thickness for batten posts	48 ,, ,,
3″ x 1″ H.W. 375′ lineal, in long lengths for round bottom of yards, stays at divisions, and short lengths attached to batten posts in ground	89 ,, ,,
3″ x 1″ Oregon 5/10′ (to cut), for along front of yards above gates	13 ,, ,,
3″ x 1″ Oregon 5/12′, 5/13′ (to cut) for gates	32 ,, ,,
Galvanised corrugated iron, 26 gauge, 27/7′, for roof.	
1¾″ screws, galvanised, 5½ lb.	
Lead washers, 5½ lb.	
9/6′ lengths 4″ guttering, quarter round.	
10 guttering brackets to suit, quarter round.	
3″ downpipe, 1/6′ length.	
12″ japanned "T" hinges, 5 pairs.	
36″ x 1″ x 18 gauge wire netting, 30′, to cover gates.	
72″ x 18 gauge wire netting, 2 rolls, for yards.	
14″ "T" hinges, 5 pairs, for gates.	
2½″ x 11 wire nails, 7 lb.	
2″ x 11 wire nails, 21 lb.	
1½″ x 14 wire nails, 7 lb.	
8 bags cement and 5 loads ashes.	

Orchard Notes.

MAY.

C. G. SAVAGE AND H. BROADFOOT.

Pruning.

By starting pruning this month on stone fruit trees that have become dormant a longer season is obtained, and often economy of labour can be effected in this way. Moreover, in some districts May is often dry, whereas much unfavourable weather occurs in the late winter months, with the result that the work is often greatly hampered. It is sometimes claimed that trees pruned early are more likely to break into bloom if a spell of abnormally warm weather follows. However, the results of departmental experiments do not definitely point to this being the case.

The chief aim when pruning young trees is to develop a strong, well-balanced framework. Excessive unchecked growth has a tendency to weaken the limbs, and if trees are allowed to commence cropping whilst the limbs are too fragile to bear the weight of fruit results may be disastrous.

The characteristics of the tree must be taken into consideration when pruning. For example, peaches bear only on last year's growth, and, unlike the apple and pear, do not develop fruit-bearing spurs. In old apple and pear trees these fruit-bearing spurs sometimes need thinning out to prevent their becoming too crowded. Factors which influence the growth and development of trees, such as soil, location, character and influence of stock, manuring, cultivation and spraying, all play their part in deciding the extent and nature of the pruner's operations and make it difficult to lay down any hard and fast rule.

Pruning and Thrips Damage.

Mr. W. W. Cooke, Fruit Instructor in the Goulburn district, reports some interesting observations in regard to the incidence of thrips damage to apple and pears last season. Occasionally, he points out, in districts where the crop generally has been a complete failure, an orchard or portions of an orchard are found carrying a good crop of fruit. Particularly was this the case with the pear varieties Williams and Packham's Triumph.

It was observed that Williams trees that carried a full crop of fruit had also made from 12 to 18 inches of new leader growth, the result of fairly heavy winter pruning. As the trees were scattered indiscriminately throughout the orchards, such factors as position, drainage, and quality of soil could not have been responsible for the growth and fruit.

With Packham's Triumph spur pruning appears to have had more influence in determining the size of the crop, and several instances were noted where trees correctly spur-pruned produced full crops, while untreated trees in the same row failed to do so.

It would appear that trees of the varieties Williams and Packham's Triumph—and possible other varieties and kinds of fruit—which are in a healthy condition and are not overbrudened with blossom, the blossom being accordingly strong and vigorous, have a far better chance of producing a full crop of fruit in a year when thrips are numerous than trees which are weak from any cause, and that sound orchard treatment—cultivation, pruning, hand thinning, spraying, &c.—will help to secure more regular crops of fruit in cases where the blossom is not absolutely destroyed by the thrips.

Preparations for Planting Deciduous Trees.

Where the land has been ploughed and subsoiled some time previously, it will probably now only need working up with harrows and cultivators to put it in a condition for planting, though in some cases a cross-ploughing might be advisable first. An endeavour should be made to finish with a deep-stirring implement that will bring the clods to the top and allow the finer soil to remain underneath.

Trees purchased from a nursery should be examined very carefully, and diseased, insect-infested, or ill-developed trees should be discarded. Those which are selected for planting should then be placed in a trench and their roots covered with fine moist soil. By this means they can be kept fresh until required for planting.

The wraps of all budded nursery stock may be removed any time now.

Woolly Aphis.

In nearly all apple districts the woolly aphis parasite, *Aphelinus mali,* keeps the aphids under control, with the result that the pest is now very little in evidence in the autumn. It is, however, sometimes found in an occasional orchard, and where this is the case and the trees are badly infested with this pest a spraying with tobacco wash or nicotine sulphate should be given at the end of the month to clean up the trees. When spraying for woolly aphis use a high pressure to break up the clusters of aphids.

Codling Moth.

Before starting the winter work the orchardist should put his packing shed in order. All containers, such as cases or bags that have held apples or pears during the fruit season, should be dipped in boiling water for not less than three minutes. Any packing shed appliances that cannot be dipped should be thoroughly searched for any codling moth grubs concealed therein.

Strawberry Planting.

Though later planting of strawberries than May is now favoured by many growers, this month was previously considered the best time for planting this berry. Provided the winter is not a severe one the plants, when put out in May, become sufficiently established to yield a main crop the first season after planting.

A booklet on strawberry culture can be purchased from the Department of Agriculture, price 7d. posted.

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Agricultural Gazette of New South Wales.

Damage by Field Mice.

And Measures to Prevent It.

Plagues of field mice occur with more or less regularity in many country districts, and this year the pest promises to become exceptionally troublesome. The mice are the field kind. They are always present in the paddocks, but usually in numbers so small that they attract no notice. They live in burrows and feed upon seed and herbage. A favourite place for their burrows is on light sandy country. Where plentiful, the burrows with the tracks leading to them can be easily seen. Under favourable conditions as to food supply and weather they breed very rapidly and soon attain to plague proportions. While conditions in the paddocks continue favourable the mice remain there, but when cold and wet weather come along they move into buildings and hay and wheat stacks.

In adopting measures to deal with mice, these facts must be kept in mind. It is not merely a matter of destroying those in the buildings and stacks, as there is a constant invasion while the mice remain in the paddocks. Damage can only be prevented by keeping the mice out of buildings and stacks, or by destroying them in the paddocks. The latter is extremely difficult to accomplish owing to the area to be covered and the risk to farm animals.

Damage may be caused by mice to a great variety of articles. They are particularly severe on harness, destroying the linings of collars, &c., and eating the leather portions. Rugs and similar materials are also severely damaged. Grain and hay are eaten and destroyed and bags are damaged beyond repair.

Owing to the great amount of damage done by mice it is well worth while to adopt measures of control. Probably the greatest damage is done to hay, which is in many cases practically ruined. It is also possible that toxins may develop in the bodies of the dead mice and poison stock to which the hay is fed.

Make Buildings and Stacks Mouse-proof.

Measures of prevention that may be adopted depend principally upon circumstances. Mice can climb like ants and burrow like rabbits. The best protection can be got by building a straddle about 2 feet high and capping the posts with a piece of plain flat galvanised iron overhanging 6 inches. It is not much use building the straddle inside a building, as the mice climb to the roof and drop down. Straddles should be built in the open and covered with a temporary roof. It is of course preferable to build permanent sheds with protection of this kind. The Department of Agriculture has endeavoured to make sheds mouse-proof by erecting mouse-proof walls around a concrete

floor, but without success. The best protection for existing buildings and stacks is a mouse-proof fence. Even this has not always proved satisfactory, as it is liable to be damaged in various ways, such as by stock, &c.

A suitable fence is made by using 3 feet flat iron. One edge is turned at right angles for 6 inches. The sheet is placed in a trench 6 inches deep with the turned edge away from the stack or building. Posts of sawn timber are spaced the length of the sheet apart and the iron tacked to it with about 2 inches lap. The posts should be 2 feet out of the ground—the height of the fence—and a cap placed over each post, otherwise the mice will climb up the rough place at the end of the sheet.

Suggestions have been made that mice might be controlled by spreading disease among them. Experience in the past has shown that this method of attempting to destroy plagues of animals is not satisfactory, although diseases develop among the animals naturally. Nevertheless, should any disease appear among the mice, it is asked that the Inspector of Stock for the district be advised so that material may be sent to the Department's Veterinary Research Station at Glenfield for investigation. The destruction of animals by artificially introduced disease is not without danger.

To Poison Mice.

Mice can be destroyed by poisoning their food or water. The following poison baits can be recommended, although perhaps the barium carbonate bait and poisoned water are to be preferred :—

Poisoned Grain.

Finely powdered strychnine	1 oz.
Baking soda	1 oz.
Sugar	1 cup
Ordinary starch	¼ cup
Wheat	20 lb.

Add the starch, sugar, baking soda, and strychnine to a quart of water, heat gently until a clear paste has formed, stirring continually. Pour the paste over the grain, mix thoroughly so that every grain of wheat is coated spread out and dry. Three tablespoonsful of flour may be used instead of starch.

Poisoned Meal.

Finely powdered strychnine	1 oz.
Sugar	¼ cup.
Fine oatmeal or wheatmeal	10 lb.

Mix thoroughly and place out in saucers or lids of tins.

Carbonate of Barium Bait.

One method of making this bait is to mix one part of the poison with four parts of flour and make into a dough. This can be rolled into a sheet about ¼ inch thick, then cut into ½-inch squares and dried. Other foods such as meat, vegetables, rolled oats, bread, cake, etc., may be used, the

poison being mixed with the material, or, in the case of sliced baits, dusted on to the surface. Under dry conditions moist baits are often more acceptable. The best results can often be obtained by using two or three different baits placed together. Barium carbonate is a relatively mild poison, but nevertheless a poison, and should consequently be kept out of the reach of children, domestic animals, etc.

Arsenic Meal.

Arsenic	1 oz.
Wheat flour	6 oz.
Tallow	3 oz.
Fine oatmeal	6 oz.

Poisoned Water.

Arsenic	2 oz.
Washing soda	4 oz.
Water	1 gallon

Place arsenic and soda in water and boil until dissolved, generally taking about half an hour. When cooling, add 2 oz. of sugar and stir well. For use, add 2 gallons water.

Strychnine Water.

Strychnine	1 oz.
Acetic acid	¼ pint
Water	12 gallons.

Great care must of course be taken with poisoned water and baits owing to the risk of animals being poisoned.

RED SQUILL POWDER.

This poison bait has been recommended during the past five years in the United States as excellent for rat control, and incidentally for mice. In addition to its effectiveness in destroying rats and mice, its principal recommendation is its relative harmlessness to human beings and domestic animals. In most cases cats, dogs, chickens and other animals either refuse red squill baits or, if they do eat them, promptly vomit them up.

The Bureau of Biological Survey in the United States points out that in using powdered red squill the choice of bait is most important. For best results several kinds of bait should be laid at the same time. A large number of small baits is more effective than a few large baits. Put out the fish, meat, and cereal baits in quarter-teaspoon quantities, or in pieces about the size of a marble. The following directions for preparing baits are the result of long experience of specialists in rodent control.

Fish.—Fresh fish ground in a meat chopper is one of the most attractive baits. If fresh fish is not available, a cheap grade of canned salmon, canned mackerel, or sardines in oil may be used. Mix 1 oz. powdered red squill with a little water to form a thin paste free of lumps, add to 1 lb. fish and mix thoroughly.

Meat.—Mix 1 oz. powdered red squill with a little water to form a thin paste free of lumps, add to 1 lb. fresh ground meat and mix thoroughly. Hamburg steak is most commonly used.

Cereals.—Mix together dry 1 oz. powdered red squill and 1 lb. cereal meal, such as oatmeal, corn meal, or bran. Add 1 pint sweet milk or water and stir to a mushy consistency.

Fruits and Vegetables.—Using a pepper shaker, dust powdered red squill over thin slices of fresh fruit or vegetables and stir or shake as the powder is applied to ensure even distribution. A small rock-melon, for example, should be cut into about sixteen slices and each slice cut into three sections. This will require 1 oz. powdered squill and will make forty-eight baits. Three medium-sized tomatoes or three bananas, each cut into about sixteen sections, may be similarly used for each ounce of squill powder.

Traps.

The most suitable traps for mice are water traps. A very effective trap of this type can be made by punching holes through a kerosene tin about 2 inches from the top on opposite sides. A heavy wire is run through this. This wire also goes through the ends of a tin such as a 2 lb. treacle tin with the lid on. The kerosene tin is sunk in the ground and filled with water to about two-thirds of its depth. Tallow or a mixture of tallow and flour is put on the rolling tin. Mice jump on to this, it revolves, and they fall into the water.

Mice can also be trapped by throwing some loose grain and chaff into a smooth tin-lined case, such as a piano case, and putting a board or bags up on the outside of the case for the mice to run up. They jump into the tin or case after the grain or chaff and it is impossible for them to climb out.

Fumigation with Hydrocyanic Acid Gas.

Fumigation, with hydrocyanic acid gas, of stacks of bagged wheat in sheds or railway trucks, or even of hay infested with mice and rats is suggested. The usual method of generating this gas is to drop sodium or potassium cyanide into china or earthenware pots containing water and sulphuric acid. There are also certain commercial products which evolve hydrocyanic acid gas. These are sold in the form of cakes, dusts, and in granular form, which, with suitable precautions and applied according to directions, are more convenient to use.

Stacks in the open and those merely roofed over cannot be fumigated unless they are well covered with tarpaulins or canvas sheets.

Hydrocyanic acid gas is a deadly poison and every precaution must be taken by the person carrying out the fumigating.

Lucerne on Grazing Properties at Michelago and Queanbeyan.

L. W. McLENNAN, B.Sc.Agr., Assistant Agrostologist, and JOHN L. GREEN, H.D.A. Agricultural Instructor.

FURTHER evidence of the successful establishment of lucerne in districts and on particular soil types that were, only a few years back, considered unsuitable for lucerne is contained in the following brief report of trials on grazing properties at Michelago and Queanbeyan. These successes with lucerne lend further force to the saying that the only land on which lucerne will not grow is that on which it has not been sown. While this is somewhat of an exaggeration, it is a useful saying in that it emphasises the fact that lucerne can be established on a wide range of soils and under vastly varying climatic conditions.

Michelago.

The success of grazing lucerne on granite hill country as well as on flats in the Michelago district is of particular significance in demonstrating its adaptability to land in this district which has formerly been regarded as unsuitable. Naturally, it provides heaviest grazing in the summer, but it is also valued as winter feed. To overcome any danger of bloat and to provide a balanced ration of grass and legume it is recommended that 3 lb. of Wimmera rye grass per acre should be sown with the lucerne.

The rainfall at Michelago was 1,934 points in 1928, 1,840 points in 1929, 1,187 points in 1930, and 2,191 points in 1931.

The Ryrie Estate, Michelago Station, Michelago.—There are 300 acres of well-established lucerne on this property. One hundred and twenty acres sown on granite hill country in April, 1928, at the rate of 5 lb. seed per acre without superphosphate carried the following stock from April, 1929, to June, 1930:—

120 cattle, April to August, 1929.
300 lambing ewes, August to November, 1929.
100 cattle, November, 1929, to March, 1930.
300 ewes, March to June, 1930.

On this station all lucerne paddocks are cultivated every second year.

Lalor Bros., "Hilldyke," Michelago.—On this property 14 acres of lucerne were sown on a granite hill in the spring of 1923. From 1923 to 1925 the lucerne was used entirely for hay, and averaged 3 tons per acre per annum. Since then it has been cut once each year and in addition has carried on the average four sheep per acre, whilst natural pastures have carried only one heep to the acre.

In March, 1929, a further 28 acres of lucerne were sown on similar country to that on which the crop was established in 1923. Seven pounds of seed per acre was used, but this could have been reduced to 4 lb. The lucerne is cultivated in August each year and has carried an average of three sheep per acre since the beginning of 1930.

Queanbeyan.

Mr. D. M. Thompson, "Pine Island," Tuggeranong.—Mr. Thompson sowed 54 acres of lucerne in October, 1927, on soil ranging from sand to a sandy loam. Spring sowing was favoured so that the plants would have sufficient vitality by the following autumn and winter to resist the characteristic heavy growth of rat-tail fescue (silky grass) and barley grass. The paddock was later subdivided into three paddocks, each one opening on to 20 acres of native grassland. These three paddocks are grazed in rotation by 230 ewes, but seasons have been so dry since sowing that it has always been necessary to spell the paddocks for a short time after each rotation. In normal years this spelling between rotations will not be necessary.

Since 1928, sheep grazing solely on natural pastures have had to be hand fed during four periods, ranging from two to seven months, but there has always been a green pick on the lucerne. Light showers, which do not affect natural pastures, always cause a quick, short growth in lucerne.

The lucerne on the sandy loam soil is retaining its vigour better than that established on the sandy soil, although the latter is thoroughly satisfactory.

Progress Report of Banana Breeding Experiments.

One of the first tasks undertaken by the Imperial College of Tropical Agriculture in Trinidad, which was established in 1922, was to investigate the control of Panama disease in the Gros Michel banana. Disease-resistant varieties were sought and a start was made with the breeding of new types.

The Empire Marketing Board has now published a progress report by Professor E. E. Cheesman recording the result of the breeding work carried out during the past nine years. The work has been most difficult, as the banana of commerce is seedless, and consequently the production of a new variety involves the crossing of the commercial varieties with a wild or semi-wild type possessing seeds and the subsequent breeding out of the seeds in the resulting cross. Considerable progress, however, is recorded in this report. A collection of bananas has been made from all parts of the world, and not the least valuable section of the investigations has been the classification of these varieties into groups and sub-species. The same variety has often many aliases in different parts of the world, and the orderly classification of the numerous so-called varieties into their real groups should prove useful to plant-breeders.

Our copy of the report from the Empire Marketing Board, London.

Lucerne in the Northern District.

Methods of Establishment Under Trial.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

SINCE the Department commenced experimenting, chiefly during the past three years, in methods of establishing lucerne in the northern district, principally for grazing, considerable expansion has taken place in the area under lucerne in that district, notably about Merriwa in the Hunter River section and in the Tamworth-Barraba district generally. In the former the lucerne has mostly been sown without an attendant crop, whereas in the

The Plots at Warrah Creek.
On the Left.—Lucerne alone at 2 lb. per acre.
On the Right.—Lucerne with oats as a "cover."
The plots were sown in autumn, 1931, and the photo was taken in December, 1931. Note the thistle growth where the lucerne was sown alone.

latter district most of the growers have sown the lucerne with either wheat or oats, and, after harvesting a grain or hay crop, have established a sturdy crop of lucerne.

So far the greater area has been heavily seeded—6 to 8 lb. per acre—but the experience gained by certain growers and by the departmental trials is being accepted, and 2 lb. seedings are becoming common.

The centres at which the Department, in co-operation with farmers, conducted the experiments are:—Currabubula, Warrah Creek, Broke, Brogheda, Dartbrook, Quipolly, Gowrie, Giant's Creek, Mitchell's Flat, Baerami Creek, Muswellbrook, New Mexico, Lochinvar, Denman and Martindale.

The fertile soils, the rainfall (24 to 30 inches annually) and the temperatures of the northern district are favourable to a luxuriant growth of grasses and weeds, which is a matter of special concern in lucerne establishment and which induced experiments with "cover" crops to test their effect on the growth of the lucerne and their efficiency in weed control. Depth and rate of sowing, and the effect of fertiliser applications were also tested, the trials being conducted on deep alluvial soils as well as on upland soils.

Methods Recommended.

As the result of careful observation of these experiments, the following recommendations are made:—

Rate of Seeding.—A seeding of 1 to 2 lb. of lucerne seed is sufficient for grazing and an occasional hay or seed crop. Spacings for this light seeding usually average 6 inches to 1 foot, which, in areas with a rainfall of 25 inches

A Stand at Currabubula from a 2 lb. per acre Seeding.
The carrying capacity on this area was more than doubled, while, in addition, over 1 ton of hay per acre was cut.

or over, permits of an attendant grass or cereal crop being sown with the lucerne, and in dryer districts allows of the sowing of these crops in the established lucerne crop during "wet" years.

"Cover" Crops.—Suitable attendant or "cover" crops are Wimmera rye grass for the dryer districts or on very large areas, and wheat, oats, barley or rye for localities with a 25-inch rainfall or over.

Where the average annual rainfall is 25 inches or over and of incidence comparable to the district from Maitland to Tamworth, and where sturdy weed growth occurs, lucerne is best established with an attendant or "cover" crop.

A variety of the saltbush family not relished by stock is very prevalent in this district. It is a prolific seeder, perennial, deep rooting and drought resisting, and becomes a dense plant with a spread of 3 feet and blankets out other plants, including lucerne. Stagger weed (*Stachys arvensis*), various thistles and barley and windmill grasses also cause thinning out of the lucerne stand. The control of these alone justifies the growing of Wimmera rye grass or a cereal as an attendant crop with lucerne, and there is also less loss from "bloat" where these crops are grown.

Control of Disease.—Owing to the risk of spreading nematode diseases of lucerne, only the minimum of cultivation should be performed in the growing crop. One cultivation each year will usually be all that is necessary for the cereal renewals, and one every second or third year for the Wimmera rye grass.

Effect of Fertilisers.—Marked improvement was shown in moderately fertile sandy loams from the application of 1 to 2 cwt. superphosphate per acre, or of a mixture of superphosphate and sulphate of ammonia in the proportion of 3 to 1.

Depth of Sowing.—Where the soil is coarse in texture and compacts only slightly after rain, the lucerne and the cereal may be sown in the one operation, about 1½ inches deep, mixing the lucerne with the cereal when no fertiliser is used and no small grain seeding attachment is available. When fertiliser is used the lucerne seed should be mixed with it, but only just before sowing.

In sandy, silty and fine-textured soils the lucerne seed should be just covered. Usually cultivation makes these soils very loose, and it will be found advantageous to roll the land before sowing and to cover the seed by a light harrowing.

On coarse-textured soils it is often necessary to compact the soil after sowing either by rolling it or by allowing stock to tramp it down.

Dairy Science Schools.

Following out the practice of previous years, the Department of Agriculture has arranged to hold dairy science schools in different centres for the convenience of dairy produce factory employees who are desirous of qualifying as cream graders and milk and cream testers under the Dairy Industry Act. A school of instruction was held at Lismore on 23rd to 27th May, while others will be held at Wagga on 25th to 29th July, Tamworth 15th to 19th August, and Wingham 5th to 9th September.

Applications for attendance or for further particulars should be made to the Under-Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, or to the Director of Dairying, at the same address. Applications should be accompanied by a fee of 5s.

Salvia Coccinea.

ESCAPED GARDEN PLANT POISONOUS TO CATTLE.

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., Senior Veterinary Research Officer.

ALTHOUGH not so well known to gardeners as *Salvia splendens* ("Bonfire Salvia"), which frequently presents a blaze of colour in our parks, *Salvia coccinea* is also used for decorative purposes. Being a hardy plant and having found conditions to its liking it has escaped from cultivation and spread in certain of our coastal districts. During the past two years attention has been focussed on it as a probable poisonous plant. Inspector Woollett, of Lismore, reported: "Salvia is suspected as poisonous by a large number of people in this district," whilst Inspector Nevill, of Kiama, stated, "On one property this plant is credited with having caused the death of fourteen cows in two years."

In order to ascertain whether this plant was dangerous to stock, which eat it readily at times, arrangements were made for a supply to be forwarded to the Glenfield Veterinary Research Station for experimental feeding. A yearling steer readily ate 15½ lb. of the plant (mixed with chaff) in three days. The supply given was partially dry and actually represented 25 lb. of the green plant. For two days the steer then exhibited lack of appetite. On the sixth day from the beginning of the experiment the steer became affected with diarrhœa and later in the day lost control of its hindquarters. It was killed for post mortem examination. The main lesions present were in the nervous system, meningitis, with hæmorrhage into the brain, being present. In cases reported upon by Inspector Woollett more severe inflammatory changes were noted in the stomach and bowels, but possibly this was due to—(*a*) ingestion of a larger amount of the plant, and/or (*b*) the ingestion of fresh-growing plant instead of that cut some time, as used in the Glenfield Station experiment.

Reports from the field indicate that the plant is most dangerous to cattle when it is young and preparing to flower, although cattle are known to eat it throughout the year.

The result of this feeding test supports the opinion held locally in different parts of our coastal districts that *Salvia coccinea* is poisonous to cattle.

AUSTRALIAN eggs exported to Great Britain have reached a very high and uniform standard of excellence. Many English traders regard Australian eggs as second only to English new-laid eggs. Exports of eggs from the Commonwealth have grown from 1,531,744 dozen in 1925 to 9,740,790 dozen in 1931.

Varieties of Oats in New South Wales.

[Continued from page 344.]

ALLAN R. CALLAGHAN, D.Phil., B.Sc (Oxon.), B.Sc.Agr., Assistant Plant Breeder.

THE chief varieties of oats grown in New South Wales have been described in the previous instalments of this series. Certain other varieties are known on the market, some of which are grown only to a very limited extent in New South Wales; others are raised exclusively in other States or in New Zealand. In addition to these, the New South Wales Department of Agriculture, through the medium of its Plant Breeding Branch, has a few promising types which are in their final stages of trial prior to being released. Brief descriptions of these lesser known Australian oats and of the new varieties of immediate promise will be given in this and subsequent issues. It is not proposed to enter into full morphological details, but rather to describe them from the agronomic viewpoint.

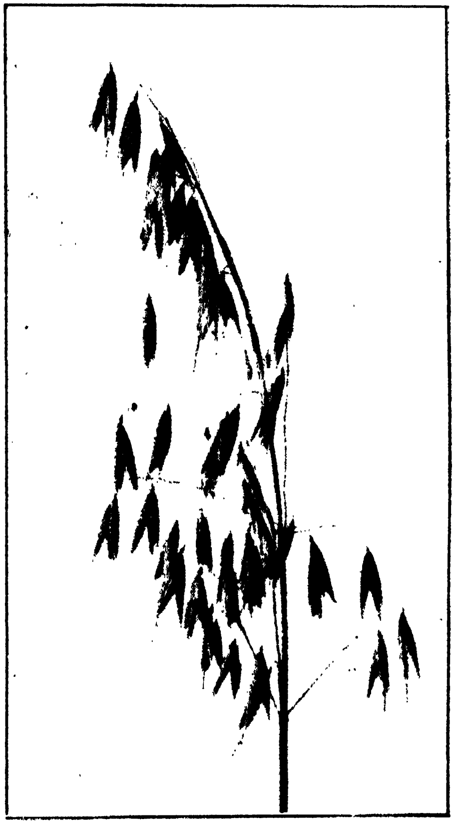


Fig. 35.—Panicle of Bombo.

Before doing this, however, it is proposed to incorporate here a key to the separation of the leading oat varieties of the State, that is, those that have already been described. This key, it is hoped, will serve the purpose of enabling, or at least assisting, in the proper identification of the varieties.

A general key for the identification of all varieties, including those to be dealt with subsequently, will be formulated at the conclusion of this series of articles, but in order to avoid confusion on the part of those not particularly concerned with the varieties to be dealt with later, this key to those oats already grown and known widely in the State, and which have already been dealt with, is given here.

KEY TO THE IDENTIFICATION OF THE OAT VARIETIES OF NEW SOUTH WALES.

1	Panicle unilateral (one sided) ...	Refer to 2.
	Panicle equilateral (spreading) ...	Refer to 3.
2	Only a few awns per panicle ...	**White Tartarian.**
	Awns frequent ...	**White Tartarian (strain, Reid).**
3	Panicle pyramidal; main branches, especially those of the the lowest whorl, leaving the rachis (or panicle stalk) at right angles or almost so) ...	Refer to 4.
	Panicle ovoidal to condensed-ovoidal; main branches, including those of the lowest whorl, leaving the rachis at angles of from 30 to 50 deg. ...	Refer to 12.
4	The primary and secondary grain of each spikelet awned ...	Refer to 5.
	The primary grain only of each spikelet awned ...	Refer to 6.
5	Very short straw, semi-erect early habit, medium-broad to broad foliage, flowering glume (or lemma) often hairy, basal hairs long and numerous, three grains per spikelet usual ...	**Palestine.**
	Medium-tall to tall straw, prostrate early habit, narrow foliage, flowering glume (or lemma) glabrous, basal hairs long and numerous, two grains per spikelet usual ...	**Algerian.**
6	Awns weak to intermediate, but never strong and geniculate	Refer to 7.
	Awns invariably strong and geniculate ...	Refer to 8.
7	Grain dark dun in colour ...	**Laggan***
	Grain yellow in colour ...	**Kelsalls.**
8	Tip of the rachis (or panicle stalk) leans over to one side; grain brown in colour; basal hairs absent ...	**Belar.**
	The rachis is erect throughout, and not inclined to one side at the tip; grain white or creamy in colour ...	Refer to 9.
9	Basal hairs absent ...	Refer to 10.
	A few long basal hairs present...	Refer to 11.
10	Grain with a dun-coloured palea (flat side of the grain) ...	**Sunrise.**
	Grain a uniform creamy white ...	**Buddah.**
11	Grain always a uniform creamy white. Leaves glabrous ...	**Myall.**
	Grain often with dun-coloured palea (flat side of the grain) and with slightly dun colourings not unusual, leaf margins slightly hairy ...	**Mulga.**
12	Awns weak to intermediate, but never strong and geniculate	Refer to 13.
	Awns invariable strong and geniculate ...	Refer to 14.
13	Panicle large, spikelets confused, grain creamy white colour	**Burke.**
	Panicle small, spikelets pectinate, grain brown and often mottled with dun colourings on brown background ...	**Fulghum.**
14	Grain uniformly light brown in colour, with short rachilla and the grains of the spikelet held tenaciously together (threshed apart with difficulty) ...	**Lachlan.**
	Grain dark brown, with darker mottlings and darker palea, grains of the spikelet usually separate by fracture but not held tenaciously (thresh apart readily) ...	Refer to 15.
15	Margins of the leaf blades fringed with hairs, nodes of the stems very hairy ...	**Gidgee.**
	Margins of leaf blades glabrous, nodes of the stems glabrous	**Guyra.**

*** The variety Dun, to be described later in this series of articles, has dun-coloured grain very like that of Laggan. The growth characteristics of the two varieties, however, are extremely different. Laggan is early maturing and erect in early growth, with low tillering capacity; it has broad, light greyish green, glabrous foliage. Dun, on the other hand, is very late maturing and very prostrate in early growth, tillers profusely and has narrow hair-fringed foliage. Furthermore, in contrast with Laggan, Dun bears a strong awn on the primary grain of most spikelets.**

How to Use the Key.

To illustrate the procedure adopted to use the key in the identification of any particular variety, take the variety Belar. The process is one of elimination and the procedure would be as follows :—

(1). Has it a unilateral (one sided) or an equilateral (spreading) panicle ? Equilateral; then refer to number 3.

(3). Is the panicle pyramidal in shape, or is it ovoidal or condensed-ovoidal ? Pyramidal; then refer to number 4.

(4). Do both the primary and secondary grains of each spikelet carry awns, or is the primary grain of each spikelet alone awned ? The primary grain only of each spikelet is awned; then refer to number 6.

(6). Is the awn of the primary grain weak to intermediate, or is it strong with a definite geniculation or knee bend? The awn is invariably strong; then refer to number 8.

(8). Is the colour of the grain brown or white to creamy ? Brown. This indicates the variety as Belar.

New Varieties of Promise.

Bombo.

Bred from the cross Abruzzes by Victory, Bombo matures a few days later than Algerian. It is an oat of excellent promise. It bears a dense productive panicle (see Fig. 35), tillers well, and possesses straw of medium height that is fine but strong, elastic and capable of standing very well. It has no tendency to shatter and yields a good sample of brown grain. Under tableland conditions it should do very well, and in such districts it is likely to be a strong rival to Algerian. So far it has yielded most satisfactorily in the stud plots at Bathurst.

Although susceptible to stem rust, it does not appear to suffer as severely as Algerian. It is susceptible to loose smut.

Lampton.

This variety was bred by crossing an unnamed strain of Abruzzes x Victory with Reid. It is a few days later maturing than Algerian and has tall medium-coarse straw. Its large ovoidal panicle is thickly laden with spikelets (see Fig. 36), and this, combined with a high tillering coefficient and exceptional vigour, accounts for its productiveness. The grain of Lampton is quite satisfactory and is of a shiny brown colour. It is of especial promise at Bathurst and should suit tableland districts well.

It is highly resistant to stem rust, a feature which will stand greatly in its favour in districts where stem rust is a constant menace. So far it has given indications of resistance to loose smut, but the tests with this disease are not yet conclusive.

Kareela.

Kareela originated as a selection from Fulghum. It is later than either Mulga or Fulghum, but slightly earlier than Guyra. It has stronger, better standing straw than Fulghum. The grain characters of Kareela are only average, but in point of yield it has given better results than Mulga in the

Fig. 36.—Panicle of Lampton.

Fig. 37.—Panicle of Kareela.

stud plots at both Cowra and Wagga. The panicle of Kareela is illustrated in Fig. 37. In the grazing oat tests it has given consistently good results, which are accounted for by its early vigour and good recovery power. It is as a grazing type that Kareela is of most promise.

It is highly susceptible to stem rust, but in the tests so far concluded it has proved highly resistant to loose smut.

Boppy.

Boppy was bred by crossing two unnamed strains of the cross White Ligowo x Algerian. It has a very high tillering capacity; its straw has the fineness and strength of Algerian, but is slightly taller and its panicle is large, open and spreading. In grain characters and maturity it is very similar to Algerian. So far it has given very satisfactory yields in the stud plots at Wagga and as a dual purpose type it shows evidence of rivalling Algerian.

Boppy is highly susceptible to stem rust and oat smut.

(*To be continued.*)

Old Wheat Varieties are Making Way for Newer Sorts.

An erroneous idea is held by some people, says Mr. H. Wenholz, Director of Plant Breeding, in his recently issued report, that new wheats evolved by the plant-breeder have some inexplicable vigour due to hybridity or purity (they do not know which), which enables them to compare favourably with the old varieties. It should be definitely understood that old varieties pass out simply because they are unable to satisfy the modern demands on a variety. For instance, Federation, which has receded in area from 33 to 16 per cent. of the total area in New South Wales, and Canberra, which has gone back from 17 to 5 per cent. since 1925, are passing because they are definitely susceptible to flag smut, foot-rot, stem rust, leaf spot (*Septoria*), loose smut, and other diseases to which newer varieties are more resistant. No effort on the part of the plant-breeder in producing stud seed of the old wheats true to type is ever likely to make them less susceptible to these diseases, which take a toll of their yield and thus make them comparatively unproductive.

Do Your Own Repairs on the Farm.

A well-equipped farm workshop or smithy soon repays for the outlay involved. It is surprising the savings that can be effected and the handy tools that it is possible to manufacture in the farm workshop. Blacksmithing, moreover, is an interesting and profitable hobby for the farmer, and it is surprising what a little practice will accomplish.

The Farmers' Handbook contains a very instructive and well illustrated section on blacksmithing for farmers, wherein is described the different tools used and the most common operations carried out by the smith. This *Handbook,* copies of which can be obtained from the Department of Agriculture, Box 36A, G.P.O., Sydney, price 11s. 6d. posted, also contains useful sections on harness making and repairing, the uses and care of rope, tank-making, carpentry, and painting.

Resistance to Stem Rust.

Recent Developments in Breeding Resistant Wheats.

S. L. MACINDOE, B.Sc.Agr., Assistant Plant Breeder.

For many years plant breeders in Australia and in other countries have attempted to evolve wheats which are highly resistant to stem rust and, at the same time, acceptable to the farmer and the milling trade. The work of producing such wheats has now reached a very promising stage both in Australia and abroad. Since the most successful methods of breeding for stem rust resistance differ from those previously adopted, a statement of the methods now being used in America, and also in New South Wales, is of interest.

Earlier Methods of Breeding for Rust Resistance.

Farrer attained a little success by breeding for rust resistance under field conditions in Australia. Most of his varieties, however, were rust escaping rather than resistant, and losses from rust attack are still experienced in some seasons when these varieties are sown. Biffen, by hybridisation and selection in the field, added resistance to yellow stripe rust (*Puccinia glumarum*) to the other desirable characters of English wheat varieties.

When, however, pathologists discovered several years ago that rust was composed of numerous physiologic forms or strains which differed in their ability to infect varieties inoculated in the seedling stage, the production of resistant varieties appeared to have been considerably complicated. It was supposed that complete resistance could only be built up by the tedious process of combining or synthesising the resistance possessed by numerous varieties to such different strains of the fungus. It was later shown, however, that seedling resistance to a group of forms could be transferred as a unit character, so that by crossing of two or more varieties seedling resistance to at least the main groups of forms could be combined in the hybrid. It was still later discovered, however, that new forms could arise almost indefinitely by mutation and by hybridisation on the barberry, and the task of producing a variety which could reasonably be expected to retain its resistance to all forms which might arise seemed well nigh impossible. It was further demonstrated that the reaction of some varieties to rust in the seedling stage was altered considerably by the conditions of temperature and light under which the test was conducted.

Pathologists, impressed with the complexity of the problem, continued to work on seedling populations under controlled greenhouse conditions, and failed to take due cognisance of the unmistakable evidence which they themselves had recorded of the difference in the reaction of varieties in the seedling stage and at maturity.

Types of Rust Resistance.

The seedling resistance to which the attention of breeders was previously chiefly directed was physiologic in character. The possibility that there existed other types of resistance of a "morphological" or "functional" nature had also been recognised. Thus Hayes, in America, showed that certain varieties possessed a much higher degree of rust resistance under field conditions than their reaction in the seedling stage indicated. It was Goulden and his associates in Canada, however, who first clearly demonstrated and defined the different types of resistance possessed by various varieties and who directed the attention of breeders to the importance of the "mature plant" type of resistance.

This "mature plant" type of resistance is most clearly illustrated by reference to varieties such as Pentad, Acme, Hope, and H. 44–24, and crosses derived from these varieties. In America they have been almost immune to all rust forms under field conditions, although they are susceptible to a large number in the seedling stage. At Glen Innes, under the most severe rust epidemic conditions, these varieties have maintained their extremely high resistance, and since the mature plant type of resistance shown by varieties of this class appears to be equally well defined in the case of all physiological forms, of which there are over one hundred in America, there is very little likelihood of new rust forms appearing to which such varieties will be susceptible.

A comparison of the physiologic type of resistance shown by Webster or Khapli with that of varieties showing mature plant resistance indicates that, in the case of Hope and related strains, the resistance in the field is of a much higher order than that of the varieties which show the seedling type of resistance. Moreover, it is fortunate that mature plant resistance to all physiologic forms is frequently inherited in a very simple manner independently of seedling resistance. Thus in Australia the most successful method of breeding wheats highly resistant to stem rust will almost certainly prove to be by the use of parents possessing mature plant resistance.

Rust-resistant Parents.

Many of the durum and emmer wheats are highly resistant to stem rust, but their resistance at one time appeared to be "linked," or associated, with certain characters which were undersirable in a bread wheat. The successful transference of the resistance of these wheats to bread wheats has played a very important part in placing breeding programmes on a surer footing.

McFadden in North Dakota transferred the high resistance of Yaroslav emmer to the bread wheats Hope and H. 44–24. These varieties were of good quality, but not quite sufficiently high yielding to replace Marquis. Strains obtained from a cross between H. 44–24 and Marquis are now ready to be distributed to farmers in America. They are equal or superior to Marquis

in yield and quality and have, in addition, the extremely high stem rust resistance of Hope. The high resistance of Pentad durum wheat has also been transferred to a bread wheat by Goulden in Canada, while Hayes at Minnesota produced Marquillo, a wheat with a somewhat different type of resistance, from a cross between Marquis and the durum wheat Iumillo. In America, therefore, the goal of producing highly rust resistant wheats well adapted to local conditions has been reached by practical breeders who have based their selection on the reaction of plants to rust at maturity in the field.

Progress of Breeding in New South Wales.

The highly rust resistant American varieties are not well adapted to Australian growing conditions, and they have consequently been crossed with the best local varieties. The fundamental rust breeding work is conducted at the New England Experiment Farm, Glen Innes, where stem rust occurs every year, and in many years is of great severity. To ensure a uniform and early spread of fungus, susceptible varieties, distributed throughout the field, are inoculated early in the season with a rust spore suspension by means of a hypodermic needle. Thousands of varieties and unfixed crossbreds are thus tested annually under conditions very favourable to rust development. Already there is unmistakable evidence that the very high resistance of Hope has been transferred to desirable agronomic lines. Such homozygous rust resistant strains are now being distributed to experiment farms in the main wheat districts where they will be fixed for agronomic characters.

Since selection is simply and accurately made at maturity rather than on the seedling reaction to rust, practical breeding for resistance has undoubtedly been transferred from the greenhouse to the field. By the hybridisation of standard Australian varieties with those known to possess "mature plant" resistance, and by selection in the field of desirable types, Australian wheat breeders are adopting the most certain means of combining stem rust resistance with the other desirable characters of Australian wheat varieties.

Field Peas Under Trial at Glen Innes.

The testing of varieties of field peas was continued at the New England Experiment Farm, Glen Innes, last season, the seed being sown on 28th July, 1931, at the rate of 88 lb. per acre with superphosphate at 60 lb. per acre.

The Experimentalist (Mr. S. C. Hodgson) reports that the growth was very satisfactory, due to the good rainfall during the growing period, and that the following yields were harvested on 6th and 7th January:—Early Dun 30 bushels 30 lb., White Brunswick 25 bushels.

These yields are considerably better than those obtained the previous year, due, it is considered, to heavier seedings and better seasonal and soil conditions. While Early Dun was outyielded the previous year, it came out on top this season. On the yields of the two years that the varieties have been under trial there is little to choose between them.

Onion Seed Production.

Successful Onion Growers use only Local Seed.

JOHN DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

LITTLE success on a commercial scale has ever attended the growing of imported varieties of onions in this country. In a measure this may be due to the fact that onion seed deteriorates rapidly, thus making it very desirable to obtain fresh seed. Progressive onion growers have long since realised the futility of persevering with imported varieties and as a consequence have always demanded seed of the best local varieties. With such encouragement, it is not surprising to find that onion seed production has been carried out in this State with marked success for a number of years now.

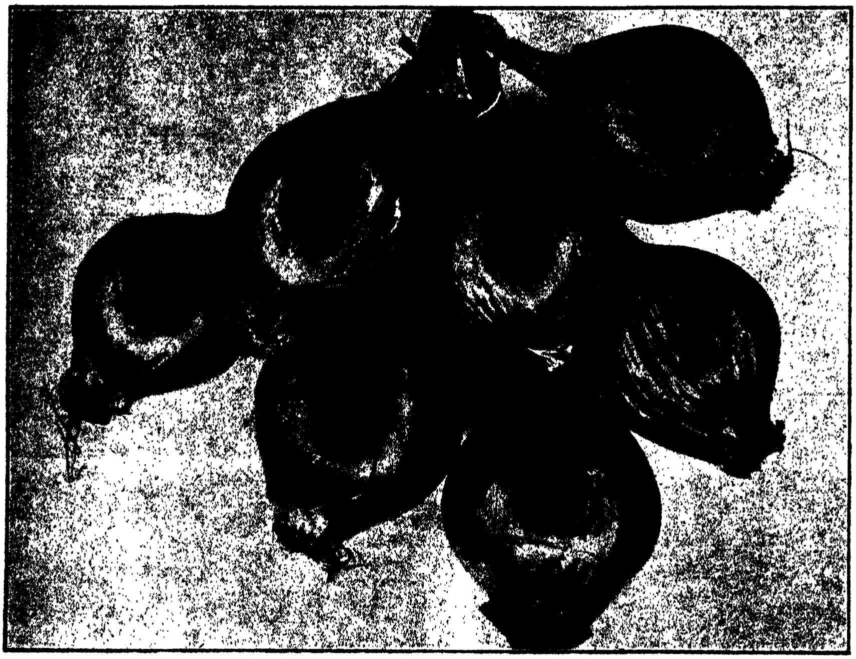
Onion-seed Crop in the Dubbo District.

Difficulty of Regulating Seed Production.

The greatest problem confronting the grower of onion seed is the difficulty of regulating production. In some years the yield of seed is very heavy, while in other years, perhaps owing to onion mildew or to insect pests such as thrips and Rutherglen Bug, the crop is a failure. In recent years some progress has been made in overcoming this drawback by transferring operations to more suitable districts, and by giving greater attention to cultural methods.

Growing and Saving the Seed.

The method of growing seed is to go through a commercial crop of mature onions and select what are considered ideal seed types. These selected bulbs are stored over the summer and planted the following autumn. Any poor-keeping types or those developing defects during storing are discarded. The seed heads shoot up from these bulbs, maturing in the spring. The heads are cut from the plants by hand at various times as the heads reach the correct stage of maturity. It is necessary to know just when to cut the

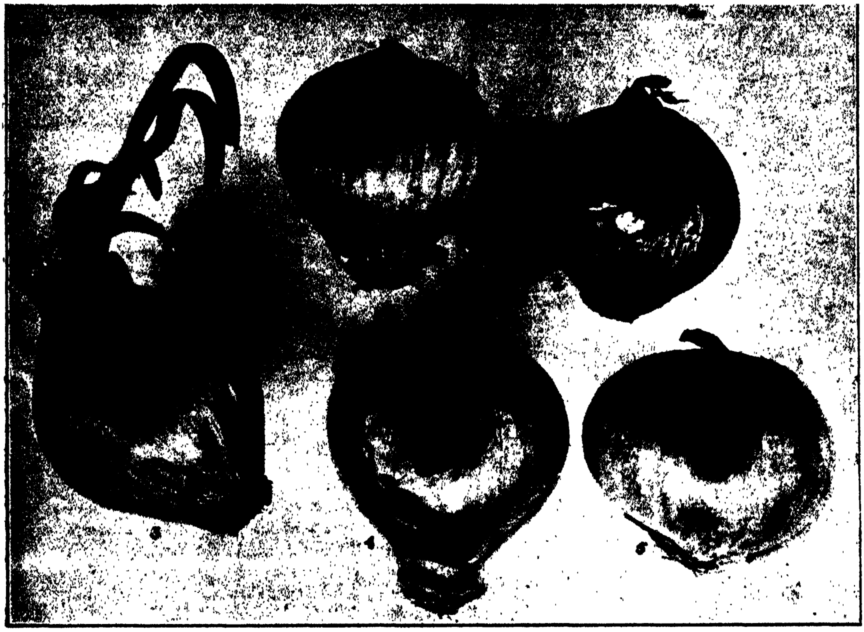


Bulbs of McKimm Variety Selected for Seed.
Note the ideal shape and uniformity of these onions.

heads. If they are cut too green great difficulty will be experienced in threshing. On the other hand, if the heads are allowed to mature fully, the best of the seed will be lost owing to shattering of the seed. The correct time to cut the heads is when the central seed balls are fully matured, which stage is indicated by their assuming a straw colour. At this stage the central seed balls are beginning to crack and a little of the seed may be lost.

The heads are dried in the sun for some time before threshing, as the balls close to the main stalk of the plant will still be in the dough stage. After drying, the seed heads are threshed, thoroughly sieved and then cleaned with a blower. It will be found that there is a great range in the quality of the seed. The best seed growers are able to clean the first-grade seed by means of the blower, but have to resort to water to clean the second-grade

seed. The "seconds" are simply thrown in water and stirred vigorously; the heavier seed sinks, while the rubbish floats. The heavy seed is removed from the water and dried as rapidly as possible. It might be worth while pointing out that the floating seed has some germinating power, and is usually sown broadcast in beds with the object of growing pickling onions.



Unsuitable Types for Seed Production.

1 and 2.—Defective outer skin. 3.—Early sprouting denotes poor keeping quality. 4.—Bottom portion of bulb too narrow. 5.—Bulb too flat. This allows water to accumulate on the flat surface and thus cause decay. Moreover, individual bulbs of types 4 and 5 are too light in weight.

Cost of Production Difficult to Estimate.

It is impossible to estimate the cost of producing onion seed, as the yields over a number of years are found to be so erratic. A yield of 300 lb. per acre is considered very good in this country. Yields much heavier than this, however, have been recorded. The price of onion seed varies considerably with the season, usually ranging from 15s. to 50s. per lb. An American grower writing to me from the State of Iowa, enclosed a photograph of a seed onion crop growing on a one-tenth acre block from which he harvested 116 lb. seed, valued at six dollars per lb.

THE ash of young wood is especially rich in potash, and, generally speaking, the ash of young and small wood, as young boughs, twigs, etc., is more valuable than that obtained from the trunk or heart of an old tree.

One of the best ways to utilise wood-ashes is in the compost heap, though they may be used alone as a top-dressing.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Bobin	... Mr. D. W. Edis, "Prestonville," Ariah Park.
	Mr. H. J. Harvey, "Kindalin," Dubbo.
Geeralying ...	... Mr. J. Parslow, "Cooya," Balladoran.
Gullen	... Mr. J. Parslow, "Cooya," Balladoran.
Nabawa	... Mr. J. Parslow, "Cooya," Balladoran.
	Mr. J. W. Watson, "Morvada," Merriwagga.
	Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Queen Fan ...	... Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
Waratah	... Mr. C. F. T. Anderson, Swan Vale, *via* Glen Innes.
	Mr. R. M. Gelling, "Cooinoo," West Wyalong.

Oats—

Belar	... Manager, Experiment Farm, Cowra.
	Mr. C. W. Buckland, "Kangetong," Ootha.
Guyra	... Manager, Experiment Farm, Bathurst.
	Messrs. Walker Bros., Wattamondara.
Mulga	... Mr. C. Bennett, "Theole," Forbes-road, Cowra.
White Tartarian	... Manager, Experiment Farm, Bathurst.

Tomatoes—

Improved Sunnybrook Earliana ...	... Mr. Albert Sorby, Macquarie Fields.
Marglobe	... Mr. S. A. Spicer, "Billabong," Lewis Ponds.

Asparagus—

Connover's Collossal	... H. Eastwood, Tascott, via Woy Woy.

Cucumbers—

Early Fortuna ...	... Mr. W. Parry, Terrigal.
	Mr. E. Money, Terrigal.

Grasses—

Perennial Rye Grass	... Mr. C. Watson, Pyree, via Nowra.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Is there anything in the poultry farming enthusiast's claims that one hen produces as much revenue in a year as a sheep, that six hens give a better return than an acre of wheat, and that thirty hens return as much as one good dairy cow?

Diseases and Pests of Glass-house Tomatoes.

C. J. MAGEE, M.Sc., B.Sc.Agr., Assistant Biologist, and W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

THE commercial cultivation of glass-house tomatoes in this State has developed into an important industry during the last few years. At the same time some of the problems of disease and insect pest control that are associated with tomato growing have become increasingly important, new phases in these problems having been introduced by the special conditions of culture connected with glass-house work. The fact that glass-house tomatoes are planted year after year in the same land presents difficulties that need not be encountered in the field cultivation of this crop, where fallowing and crop rotation alone enable the grower to deal effectively with many pests and diseases. Further, the special environmental conditions which obtain in the glass-house—the unusual degrees of temperature and humidity—are frequently very favourable for the optimum development of parasites which may be of minor importance in the outdoor crop. Then again, varieties which have been selected for disease resistance under field conditions are of little value to the glass-house grower.

It is the aim of this article to present some of the outstanding features of the more important diseases and pests of this crop, with the belief that a clearer understanding of the nature of the losses which occur will enable the grower to deal more intelligently with them. A study of past experiences in the cultivation of glass-house tomatoes reveals the fact that heavy tolls are taken nearly every year by insect pests and diseases. These losses could be avoided if appropriate control measures were adopted. It is not possible to outline a general method of procedure that will meet all cases, but before the seed is planted the grower should be certain that the soil in the seed-bed and houses is free from parasitic fungi, eelworms and insect pests. If necessary the soil should be sterilised. A leaflet on steam sterilisation of glass-house soils is available on application to the Department. During the growth of the crop the plants should be protected from diseases and insect pests by timely applications of suitable sprays and dusts. For instance, in the case of Irish blight, spraying should commence in the seed-bed and be continued throughout the season. With most insect pests it is usually not necessary to take action until the insects have made their appearance. The grower should have on hand or be able to procure at short notice the fungicides and insecticides necessary for the control of the diseases and pests that ordinarily may be expected to occur. Equipment should consist of a knapsack type of spray

pump and a double-action or rotary blower for dusting purposes. A leaflet on the preparation of Bordeaux mixture and another entitled "A B C of Spraying" may be obtained free of charge on application to the Department.

Diseases of Glass-house Tomatoes.

Fusarium Wilt.

Fusarium wilt is probably the most important of the glass-house diseases, particularly in the Warriewood and neighbouring districts. The disease is caused by the parasitic fungus *Fusarium lycopersici*, which enters the plant through the roots and invades the water-conducting tissues of the stem. Plants are liable to attack at all stages of growth. Seedlings affected with the disease become stunted, wilt during the warmer hours of the day, and finally die. If seed is planted in infested soil many plants succumb while in the seedling stage, but frequently the disease is not noticed until the first trusses of fruit are about to ripen. From then on a large proportion of the plants may die prematurely. Badly infested houses may produce only one half or even less of the expected yield.

On splitting open the lower portion of the stem of a diseased plant, a brownish discoloration will be seen in the fibrous or sap-conducting region.

When once introduced into a glass-house soil the fungus may live there for several years even in the absence of tomatoes. The growth of the fungus is favoured by high soil temperatures (optimum 80 to 85 deg. Fahr.) and light open soils. This explains why fusarium wilt has become a serious disease in the sandy soils of the coast, its severity increasing as the warm weather approaches.

Control Measures.

1. In the seed-boxes or seed-beds use only soil which is known to be free from the fungus. It may be necessary to sterilise the soil before use. Soil may be sterilised by treatment with steam under pressure for an hour or more; or, in the case of small quantities, by baking moist soil for several hours on a sheet of iron over a fire with frequent stirring.

At Warriewood, formalin has been found to be effective in the treatment of soil in seed-boxes to free it from the fungus. One part of commercial formalin is diluted with fifty parts of water to make a sterilising solution. This is applied to the soil at the rate of one half gallon to the square foot. The soil is then covered with boards or bags for twelve hours or more, after which the covers are removed and the soil stirred several times within the next two weeks to allow the fumes to escape before planting.

2. If the soil in any glass-house is badly infested, sterilise the whole of the soil with steam by the inverted-pan method. Treatment of the whole of the soil in the glass-house with formalin has been tested out by several growers at Warriewood, but has not been found to be effective.

3. Apply heavy dressings of farmyard manure. Up to 8 or 10 tons should be added to the standard house. Observations indicate that this method, besides adding to soil fertility, will greatly prolong the period during which houses may be profitably cropped, even though the wilt fungus is present.

4. No varieties resistant to fusarium wilt and at the same time suitable for cultivation under glass-house conditions in this State are known. Efforts are being made by the Department to breed a variety of this type.

5. Adopt late planting. Delay planting the seed until relatively cool soil temperatures prevail, as in May. Late planting is also of value in relation to late blight, but for other reasons.

6. After harvest pull up and burn all plant parts immediately. If plants are allowed to rot *in situ* the fungus in diseased plants is enabled to mature millions of spores (or seeds) which serve to spread the infection throughout the soil.

Tomato Plant Affected with Fusarium Wilt at a Late Stage of Growth.

Verticillium Wilt.

This wilt, with symptoms practically identical with fusarium wilt. causes losses in glass-houses established on relatively heavy soils in the Parramatta, Penrith, Wagga and other districts. The causal fungus of this disease is *Verticillium albo-atrum*, which is favoured by relatively low soil temperatures (optimum 65 to 70 deg. Fahr.). The disease is most severe during the winter months, and many affected plants make a favourable recovery when warmer weather sets in. Control measures as outlined under fusarium wilt should be followed.

Late Blight or Irish Blight.

Heavy losses may be caused by this disease during periods of heavy rain in the winter. The disease is caused by the parasitic fungus *Phytophthora infestans*.

The fungus is able to become destructive only under conditions of high humidity. July, August and September are the months during which blight

generally makes its appearance. Losses are liable to be most severe in early-planted houses on account of the heavy foliage which is carried during the months most favourable to the disease.

Stem of Tomato Plant, showing Stem Girdle Condition caused by the Late Blight Fungus.

The spores (or seeds) of the fungus are blown around by air currents, and alighting on the foliage, stems and fruit may germinate and invade the plant tissues if suitable moisture and temperature conditions prevail. Dark water-soaked areas are produced on the leaves and leaf stalks, which may shrivel or, if conditions are still moist, may rot. Dark green diseased areas may also appear on the fruit and stem. The diseased area frequently encircles the entire stem, causing shrivelling and resulting in a "stem-girdle" condition. In spite of this girdling, infected plants frequently remain green for some time.

Under continued moist conditions white fluffy outgrowths of the fungus may occur from the diseased area on the leaves, stem and fruit. It is on this downy outgrowth that the spores (or seeds) of the fungus are produced.

Control Measures.

1. In order to prevent the fungus gaining entry to the plant, every effort should be made to keep a coating of Bordeaux mixture (1–1–10) on the foliage and stems of the plants. Spraying should be commenced when the plants are in the seed-bed and should be repeated every fortnight. Difficulty may be experienced in spraying the plants in the later stages of growth owing to the density of the foliage. When this occurs a change-over should be made to fortnightly dusting with a good quality Bordeaux dust.

2. Excessive humidity in the houses should be avoided by giving attention to ventilation and by watering during the winter months only when necessary.

3. Soil used in the seed-bed should be sterilised, as outlined in the control measures for fusarium wilt.

4. Late planting will reduce the risk of blight outbreaks. Setting the plants out in the houses during late May or early June is recommended.

Root Knot or Eelworm Galls.

This disease is readily recognised by the presence of lumpy swellings on the roots. Affected plants are usually a paler green than normal and make very slow growth. The disease is caused by a very small worm, which is practically invisible to the naked eye. The worms penetrate into the roots and the irritation they set up leads to the formation of the galls. The female eelworm produces large numbers of eggs from which the young hatch and penetrate further into the roots or migrate through the soil to other plants. Eelworms are generally most troublesome in sandy soils and during the warmer months of the year. Once soil is infested it may harbour the pest for many years, even in the absence of growing plants.

Control Measures.

The only satisfactory method of dealing with the pest is to sterilise the soil with steam as recommended for fusarium wilt. Various chemical treatments have been tried for eelworms, but it is doubtful whether the results obtained repay the labour and expense involved.

Early Blight or Macrosporium Leaf Spot.

This disease may be recognised by the appearance of dark-coloured target-like spots on the leaves. The spots usually commence at the margin of the leaf and spread in towards the main vein. Affected leaflets shrivel and dry up. The fungus (*Macrosporium solani*) does not attack the stems and fruit in this State. High temperatures and humidity favour its development.

Routine spraying with Bordeaux mixture from the seedling stage onwards, together with proper ventilation, will reduce the losses from this disease to a minimum.

Spotted or Bronze Wilt.

This is an insect-transmitted disease and is caused by inoculation of the plants with a virus, which is carried by thrips that have previously fed on diseased plants. The disease is rarely of consequence in glass-house crops in the Warriewood district, but frequently appears in houses further removed from the coast.

Spotted wilt may be recognised by stunting and unthriftiness of the plant and the appearance of faint glistening bronze spots on the youngest leaves and stems. This disease is not carried in the seed, and the soil does not become infested. Spotted wilt, unlike a fungous disease, does not spread without the agency of thrips. Thrips, however, are usually present in most glass-houses.

CONTROL MEASURES

Infected plants should be removed and burned as soon as detected. Attempts at checking the spread of the disease by insecticidal sprays have not been successful.

Tomato Leaves Showing Early Signs of the Spotted Wilt Disease.

Mosaic.

Mosaic belongs to the same class of diseases as spotted wilt, being due to the presence of a virus in the sap. The infectious virus may be transferred from diseased to healthy plants by aphids or by the transfer of sap during pruning, &c. The soil does not become infected, nor is the disease carried in the seed. Mosaic may be recognised by the appearance of irregular light green and dark green areas on the leaves in place of the normal uniform green colour. The leaves may become badly distorted, and if infection takes place early the plant may be stunted

Infected plants should be removed as soon as detected. It is from a few plants that make their appearance early in the season that the disease spreads.

Septoria Spot of Tomatoes.

This disease, caused by the parasitic fungus *Septoria lycopersici*, occasionally makes its appearance when houses are being forced by heavy watering during the latter and warmer part of the season. Spots of a characteristic type are produced on the foliage and flower trusses and may cause defoliation and falling of the flowers. The spots are more or less circular, with brown margins and light grey centres; careful examination will reveal minute black dots at the centre of the spots.

Tomato Leaf affected with Septoria Leaf Spot.

Tomato Leaf Showing Mosaic.
[*After Kraybill.*

Routine spraying with Bordeaux mixture, which should always be carried out from the seed-bed stage onwards for the control of late blight, together with attention to ventilation when warm weather sets in, will remove all danger from this disease.

Pests of Glass-house Tomatoes.

Aphids or Plant Lice.

Green aphids, when numerous on tomatoes, rob the plants of their vitality by sucking the sap from the tissues; they feed on the under-surfaces of the leaves and on the tips of the stems and branches, where they will be found in

clusters. A sooty mould sometimes develops on the foliage following aphid attack, the mould living upon the honey-dew, a sticky liquid which the aphids excrete.

During its growth the young aphid casts its skin several times; these skins being white are sometimes more noticeable than the aphids themselves, and an infestation is sometimes mistaken by growers for white fly attack.

Control.

1. *Nicotine dust.*—Glass-houses can be rapidly treated for aphid infestation by removing panes of glass at 6 to 8 feet intervals along each side of the house and directing a blast of 2½ per cent. nicotine dust through the openings. Dusting is most effective at temperatures above 76 deg. Fahr.

2. *Nicotine sulphate spray.*—Use the nicotine sulphate at a strength of 1 in 600, adding soap at the rate of 1½ lb. to 50 gal. spray. To make 4 gal. spray use 1 oz. nicotine sulphate and 2 oz. soap. Nicotine sulphate and Bordeaux may be mixed and applied together, but in this case soap should not be added.

Thrips.

In seasons when thrips (*Thysanoptera*) are abundant the blossoms may be infested and setting of the fruit prevented.

Control of thrips is best effected with a 2½ per cent. nicotine dust applied at intervals of three or four days in a similar manner to that described for the treatment for aphids.

The Tomato Mite.

The tomato mite (*Phyllocoptes lycopersici*) may be expected to occur on glass-house tomatoes from August onwards, unless measures are adopted which prevent its occurrence. These mites breed and feed upon the surface of the plant, and as they are barely visible to the naked eye their presence only becomes evident when the plants have developed those symptoms of attack which are described below. The mites multiply rapidly under glass-house conditions, and the lightest attack soon becomes a serious infestation. Young as well as old plants are attacked, but most damage occurs on plants that are in heavy bearing.

Symptoms of Attack.

A dark-brown rusted appearance of the stems and a slight silvering of the foliage, accompanied by a curling and drooping of the lower leaves, are the first symptoms of attack. Later, the reddish-brown discolouration spreads to the foliage, and the leaves die and drop off. Finally, the lower portion of the plant becomes largely defoliated, only the topmost leaves remaining green. Blossoming also is affected, whilst the fruit ripens prematurely, its skin frequently becoming roughened and corky.

Characteristic Damage Caused by Tomato Mite.

CONTROL.

To prevent attack glass-house tomatoes should be treated at regular intervals from August onwards. If treatment be delayed until the first signs of infestation appear, the plants already will have received a severe setback.

Treat with fine sulphur dust, say every three or four weeks, or as often as traces of the sulphur have disappeared from the leaves. Lime-sulphur spray (1 in 80), or atomic sulphur spray (1 lb. to 12 gal. water) also gives control. Lime-sulphur, however, should not be used within a week of treating with Bordeaux.

White Fly.

The white fly (*Aleurodidæ*), which is a small, delicate insect, feeds by sucking the sap from the plants. The adult flies are white and very fragile; they congregate mainly on the under-surface of the leaves, but when disturbed they flit and swarm about the plants for a few seconds before again settling down beneath the leaves.

Adult White Flies on Tomato Leaves.

The adults lay their eggs on the under-surfaces of the leaves. The eggs hatch to form oval, scale-like bodies, which, once they commence to suck the sap from the leaf-tissues, remain in a fixed position on the lower leaf-surface until they transform into the adult flies.

With white-fly infestation there is usually a heavy development of sooty mould, which lives upon a sugary liquid spread over the leaves by the insects. This film of sooty mould prevents the leaves from utilising the sun's rays in the manufacture of food materials, and the plant loses vigour by this means as well as by the feeding of the insects.

CONTROL.

1. Treat with nicotine dust ($2\frac{1}{2}$ per cent.) as for aphids during the hottest period of the day. Satisfactory results are obtained only at temperatures of 76 deg. Fahr. or over.

2. Spray with nicotine sulphate (1 in 600) plus soap (1½ lb. to 50 gal. of the spray). To make 4 gal. spray use 1 oz. nicotine sulphate and 2 oz. soap. to 4 gal. water.

3. Fumigate either with calcium cyanide or with potassium cyanide and sulphuric acid.

The degree to which glass-houses may be made air-tight varies considerably, and the escape of gas during fumigation varies accordingly. A fixed dosage per 1,000 cubic feet of space cannot therefore be specified. Whilst the Department has used 2½ oz. calcium cyanide per 1,000 cub. ft. against white flies without damaging the tomato plants, it is conceivable that this dosage might cause serious damage in some houses. To avoid the possibility of damaging the plants, one or other of the following dosages should first be tried :—

(*a*) Calcium cyanide, ¼ oz. per 1,000 cubic feet of space; or

(*b*) Potassium cyanide ¼ oz., sulphuric acid ¼ oz. (fluid measure), water ¾ oz. (fluid) to 1,000 cubic feet of space.

If the kill is not satisfactory the quantities should be increased by ¼ oz. at each subsequent treatment until the correct amount is determined.

Cyanide fumigation should be commenced in the evening shortly after dark and the house should be opened up next morning before sunrise. The house, however, should not be entered for two or three hours after opening up by which time all the poisonous fumes should have escaped.

Fumigation must not take place within twenty-four hours of watering, the night on which it is carried out should be still, and the temperature should not be lower than 55 deg. Fahr., best results being obtained between 60 and 70 deg. Fahr.

The eggs of the white fly are not destroyed by any of the above treatments. It is, therefore, necessary to give a second treatment as soon as all the eggs have hatched. In summer, a fortnight should elapse before the second treatment is made, but in the cooler weather the period should extend to three weeks.

Tomato Caterpillar.

The tomato caterpillar (*Heliothis obsoleta*) gouges out large holes in the fruit, a single caterpillar being capable of damaging several fruit.

The white, rounded eggs of the moth are about the size of a pin's head. They are laid on the under-surfaces of the leaves, on the fruit and blossoms and on the tips of the stems and branches.

Control.

Dust with a 50 per cent. lead arsenate dust, or spray with lead arsenate at the rate of 2 oz. of the powder to 4 gal. water. Treat at weekly intervals, commencing with the first appearance of the eggs. If it becomes necessary to treat a crop in bearing, the fruit should be wiped free of lead arsenate before marketing.

CULTIVATION AND TOP-DRESSING OF PASTURES IN THE COONABARABRAN DISTRICT.

SINCE 1929, Mr. J. A. Murray, of "Talgai," Ulamambri, has co-operated with the Department of Agriculture in carrying out pasture trials. In the autumn of 1929 he sowed a number of plots to different grasses, clovers, lucerne, and also a mixture of Wimmera rye grass and lucerne. Aphids, however, practically killed out all the clovers, and in the spring of 1930 the only plants producing a satisfactory bulk of green fodder were lucerne and Wimmera rye grass. A few plants of subterranean, Bokhara, and perennial red clover persisted, the former showing most promise. Only odd stools of cocksfoot and tall fescue were to be found, while perennial rye grass had died right out.

These trials were located on a light sandy soil of poor fertility, and it was decided to ascertain the effect of top-dressing and cultivation on the improved as well as the natural pastures. The treatments, which comprised cultivation alone, cultivation combined with applications of 70 and 90 lb. superphosphate, and top-dressing alone with 90 lb. superphosphate, were given at right angles across the original grass plots, portion of each being left untreated for purpose of comparison. The natural pasture at time of treatment (March, 1931) consisted mainly of umbrella, red, couch, and love grasses.

The autumn rains were favourable, but heavy rains in May and June resulted in the soil becoming water-logged. When the dry spell set in in the spring the surface soil baked hard, thus retarding growth. On this class of country in the Coonabarabran district green feed is always scarce from natural pastures during the winter months, but within a month of treatment the growth on the cultivated plots was more vigorous, rapid, and of a healthier appearance than on the areas not cultivated, and this advantage was maintained throughout the growing period. Considering the class of country, the lucerne has done exceptionally well, although little difference can be noticed between the plots that were seeded at 2, 4, and 6 lb. per acre. The Wimmera rye grass has spread over a wide area.

To obtain maximum results from Wimmera rye grass on the light sandy soils which run together it must be treated, to some extent, as a cultivated crop. Wimmera rye grass is a most prolific seeder, and unless heavily grazed when in seed the self-seeding for the following season is too heavy and the plants become overcrowded. When sown on cultivated paddocks, either in a mixture or with wheat, it flourishes for two to three seasons and then tends to choke itself out. A cultivation in the autumn of every second year materially helps to rectify the trouble. In these trials it was estimated that the increased yield as a result of cultivation was more than double that of the untreated crop.

The increase in growth from top-dressing with superhphosphate on the cultivated plots was apparent but not very marked, whereas the plot that was top-dressed only showed but little advantage over the untreated plot. Cultivation and top-dressing of the natural pasture, says Mr. G. Nicholson, Senior Agricultural Instructor, in reporting on these trials, have not been responsible for a sufficient increase in growth to warrant the expenditure involved.

FINVOY GOLDEN NOBLE (**Imp. N.Z., Vol. 15**).

Departmental herds include the following Stud Bulls:—

Guernsey: HOPEFUL OF WOLLONGBAR (499); Champion, R. A. Show, Sydney, 1928. *Ayrshire:* SCOTTISH PRIDE OF GOWRIE PARK (3797). First and Champion, R. A. Show, Sydney, 1927; First and Reserve Champion, R. A. Show, Sydney, 1928. *Milking Shorthorn:* MORNING STAR OF DARBALARA (Vol. 8), Second, R. A. Show, Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522.5 lb. milk, 1,614.1 lb. butter fat in 365 days. *Jersey:* FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

The Department has for sale young bulls from tested dams of the following breeds:—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

Application should be made to—THE UNDER SECRETARY, Department of Agriculture, SYDNEY

Breeding Records for Dairy Farmers.

HELPFUL IN CONTROLLING DISEASE.

K. S. McINTOSH, H.D.A., B.V.Sc., Government Veterinary Officer.

WITH the exception of purebred herds in New South Wales, the keeping of records of the breeding of dairy cattle receives but scant attention. The more progressive dairy farmer usually keeps a "log," or diary, of the various incidents which occur from time to time, such as the purchase of stock, fodder, fittings, sales of stock, breeding, deaths, and such other details as he considers worth noting. Occasionally one finds that a separate record of breeding is kept, but usually the farmer relies on his memory or on the casual examination of his cows in determining pedigrees or the periods of pregnancy. The two reasons for not keeping such records in a methodical manner are, firstly, over-confidence on the part of the farmer regarding his ability to remember, and, secondly, that it means extra trouble.

The Value of Breeding Records.

Surely if dairy farming is to be carried on as a business proposition, the breeding of healthy stock, the regulation of the milk supply of the herd during the various seasons of the year and a record of the productivity of animals (both cows and bulls) as regards offspring should be considered very important matters. Furthermore, contagious abortion—an insidious disease of cattle which seems to be gradually spreading among our dairy herds—is often not detected until it has gained a firm foothold in the herd, simply because no particular note is kept of aborting cows or of those which are difficult to get in calf. Vaginitis and other diseases causing sterility, which are possibly amenable to treatment, are frequently overlooked, the farmer only having a vague idea that some of his cows seem to be difficult to get in calf.

With a simple but methodical record of the breeding history of each cow it is an easy matter to tell at a glance which cows are not breeding normally. Again if advice is sought from a veterinary surgeon or one of the departmental officers, such information is invaluable in enabling him to arrive at an accurate diagnosis for the purpose of recommending suitable treatment.

Apart altogether from the disease aspect of the question, the reasons mentioned earlier in this article should be more than sufficient to induce intelligent farmers to adopt some methodical system of keeping breeding records.

A Simple Breeding Record Form.

The following form is suggested for this purpose:—

Name of cow, colour, brand, age.	Served.				Calved.		Remarks.
	Date.			Bull.	Sex of calf.	Date.	

Such a form could be ruled in an ordinary exercise book or a more elaborate book according to the size of the herd and the owner's taste. It should extend right across the two pages to allow plenty of room. Sufficient space should be allowed for each cow to enable several successive years' breeding to be recorded.

Under the heading "Served," the sub-heading "date" has three columns. As a rule only one of these will be used, but the remaining two will be found necessary in the case of cows which are difficult to get in calf. The name of the bull should be stated for two reasons, firstly, as a record of the pedigree of the calf and, secondly, because if breeding troubles should arise it is not unlikely that he is the cause. The date of calving is particularly useful as it shows when this particular cow will "come into milk," and whether the calf is born at full time or prematurely. The "remarks" column should contain such information as "difficult parturition," "still-born calf," "discharge from vulva," "retained afterbirth," "attacks of milk fever or mammitis at or shortly after calving," &c., &c.

When read in conjunction with milk and butter-fat records, the above information would be invaluable to the dairy farmer in culling his herd and estimating the true worth of his animals.

This method could, of course, only be carried out successfully if the bull were kept separate from the remainder of the herd. The practice of running the bull separately is now rapidly gaining ground and is strongly recommended for reasons which are legion.

Infectious Diseases Reported in April.

The following outbreaks of the more important infectious diseases were reported during the month of April, 1932:—

Anthrax	2
Blackleg	6
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	3
Swine fever	Nil.
Contagious pneumonia	5
Necrotic enteritis	Nil.

—Max Henry, Chief Veterinary Surgeon.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Sydney Sheep	June 23, 24, 25	Parkes (L. S. Seaborn)	Aug. 30, 31
Cootamundra Sheep Show (G. B. Black)	July 20, 21	Forbes (E. A. Austen)	Sept. 6, 7
Tullamore (S. D. Cameron) ...	" 27	Lockhart	" 21
Peak Hill (W. R. L. Crush) ...	Aug. 2, 3	Berrigan (R. Wardrop)	" 28
Trundle (D. Leighton)	" 9, 10	Hay...	" 28, 29
Condobolin (J. M. Cooney) ...	" 16, 17	Narrandera (J. D. Newth) ...	Oct. 4, 5
Bogan Gate (J. a'Beckett) ...	" 24	Griffith (M. E. Sellin)	" 18, 19
		Cootamundra (G. B. Black) ...	" 25, 26

Contagious Abortion.

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., D.V.H., Senior Veterinary Research Officer, Glenfield Veterinary Research Station.

Contagious abortion presents perhaps more difficulties in the way of control and eradication than any other disease of dairy cattle. In a lecture before the United Pure-bred Dairy Cattle Breeders' Association of New South Wales on 24th March last, Mr. W. L. Hindmarsh, Senior Veterinary Research Officer, outlined the present position and the extent of our knowledge of the disease. This lecture is printed in the following pages, and is prefaced by forewords by Mr. H. D. B. Cox, on behalf of the Veterinary Research Committee of the United Pure-bred Cattle Breeders' Association of New South Wales, and by Mr. Max Henry, B.V.Sc., M.R.C.V.S., in which is indicated the line of action which the breeders, in conjunction with the Department of Agriculture, propose to follow in combating the disease.

Foreword by Mr. H. D. B. Cox.

THE loss suffered by the dairying industry and the economic loss entailed to the nation by the continuing ravages of the disease commonly known to dairy-farmers as contagious abortion have actuated the United Pure-bred Dairy Cattle Breeders' Association of New South Wales in placing resolutions on its records year by year calling for "something to be done."

Early reluctance of pedigree-stock breeders to admit existence of the disease in their herds later gave way to a general anxiety to do something more substantial than pass resolutions. The difficulty, however, was to devise or suggest any hopeful course of practical action.

A visit last December to the Veterinary Research Station at Glenfield by the Council of the Association and others suggested a promising starting-point. The facilities of the station for research into diseases of cattle and the evident value to the live stock industry of information gained or accumulating from investigations carried out or in progress made a deep impression. This visit moved the Association to appoint a committee, later designated the United Breeders' Veterinary Research Committee, for the following purposes:—

(a) Co-operating with the Department of Agriculture in a consultative and advisory capacity in regard to research in cattle diseases.

(b) Acting as a channel of publicity and information to the constituent societies and to the dairy industry.

(c) Initiating steps which may be calculated to promote the foregoing.

Announcement of the establishment of the committee has been greeted with instant and widespread interest. The Under Secretary (Mr. G. D. Ross), Department of Agriculture, has promised the most cordial co-operation of his Department, while, with the approval of the Minister for

Agriculture, Mr. Max Henry (Chief Veterinary Surgeon), and Dr. H. R. Seddon (Director of Veterinary Research) have joined the committee.

While contagious abortion, its prevention and cure, is given primary place in the Veterinary Research Committee's immediate objective, accompanying maladies of the bovine reproductive system—sterility, vaginitis, etc.—are necessarily linked with it, and the contiguous disease mastitis ("mammitis") is equally clamorous for remedy.

In view of the urgency and magnitude of the work, the committee is convinced that concentrated attention upon these disease problems should be given at a recognised institution dealing with the disease of stock, and to that institution should be attached for special work men thoroughly qualified to undertake it. If such men work under the supervision and in collaboration with others engaged in similar problems, the probability of success is greatly enhanced. To have this work carried out means money, but the cost must not be counted without estimating the probable returns.

It is accepted in the manufacturing industries that one of the surest methods of increasing production and profit is to stop or reduce *waste*. Not less, it is true, in the dairying and stock-breeding industry. Nothing better than a rough guess at the losses sustained from the group of disease conditions here referred to is possible, but everyone is agreed that the loss, direct and indirect, is very considerable. If this loss is equal to 10 per cent. of the total dairy production of the Commonwealth (and probably this is not overstated), there is a "waste" of about £4,000,000 a year to be retrieved by successful investigation, to the benefit of the industry and the nation.

To initiate the actual work of the Veterinary Research Committee, the subjoined lecture in relation to contagious abortion was arranged in collaboration with the Department of Agriculture. Its primary aim was to enlighten breeders and dairy-farmers as to the present state of knowledge regarding the disease.

Subsequent to the publication of this article, the committee intends to launch an appeal with the idea of securing funds to enable work to be carried out, and it is hoped to receive the help of all societies and organisations interested in the prosperity of the cattle-breeding industries.

Foreword by Mr. Max Henry, Chief Veterinary Surgeon.

The foregoing statement by Mr. Cox indicates the line of action which the breeders in conjunction with the Department propose to follow. It is doubtful if any disease of dairy cattle presents such difficulties in the way of control and eradication. The methods by which it is spread are of such a nature as to place the most serious obstacles in the way of official control without exposing stockowners to grave interference in traffic in cattle. These interferences would be so grave under Australian conditions that no State has attempted them. In other countries where the methods of cattle-raising are different, the official staff much greater and veterinary assistance readily available at all points, something has been attempted, but without success.

The methods of treatment now available, while they do, if intelligently applied, permit a farmer to reduce his economic losses, do not bring about a cure of the affected animals. That is to say, they still remain infected and are a danger to susceptible cattle. Thus in all directions—official State control, farm control, and treatment—there is need for further research.

The following article by Mr. Hindmarsh gives the present position of our knowledge. Using this as a basis, it is hoped, if funds can be obtained, to carry out extensive research work, the results of which will be made known to all interested. The veterinary officers of the Department have already carried out a very considerable amount of work on this disease, and are closely in touch with the work being carried out elsewhere, particularly in America. The reports all show that everywhere the same difficulties which confront us are being met with. If this country can solve only one or two of the problems confronting us in connection with this disease, a big step forward will have been taken.

Mr. Hindmarsh's Lecture on Contagious Abortion.

Abortion may be described as the act of expelling the young animal from the uterus or womb before it is sufficiently developed to live. When the calf is expelled before full time, but is able to live, the act is known as a premature birth. Abortion may be due to many causes, and it is commonly believed by stockowners that all kinds of untoward occurrences may be responsible for loss of the calf before its development in the womb is complete. As a matter of fact, although abortion may at times be due to accident or to rough handling, the number of such cases is negligible and many cases which are attributed by the owner to misadventure are in fact the result of infection. By "contagious" abortion of cattle we refer to a specific disease which is characterised in the main by the act of abortion and which is caused by infection with the germ called the bacillus of abortion or Bang's bacillus. Other infections of the womb are capable of causing abortion, but the most commonly encountered infection is that with the bacillus of abortion. One can quite safely say that almost all abortions in cattle can be suspected as having been caused by this microbe, so widespread is it throughout the State.

Infected Cattle Do Not Always Abort.

Although the usual result of infection with Bang's bacillus is abortion, this may not necessarily happen. Cattle may be infected and not abort. Such animals, however, may be just as dangerous a source of infection to other cattle as any that have lost their calves. Further, although after abortion the germ may persist in the body of the cow, it is probable that she will carry the next calf to full time. It is almost certain that if she aborts twice she will carry the third calf to a successful parturition. In spite of these facts and the apparently normal births, such cows are still a source of danger and are capable of transmitting the infection to susceptible animals at each succeeding birth.

It will be readily understood that one of the farmer's problems is to know whether any of his cattle are infected and more particularly to know whether any cattle which he proposes to introduce to his herd are infected.

Cases of Early Abortion Not Always Noticed.

An annoying and not always recognised feature of this disease is the early abortion. As a rule, when abortion first attacks a herd, the calves are lost at about the third or fourth month of pregnancy. Subsequent abortions are frequently found to occur at a later period of development so that some may be really described as premature births. On the other hand, some abortions may take place so early in the life of the calf that they are not noticed at all by the owner, and the first intimation that all is not well with cows is their return to the bull when it is thought that they are safely in calf. Unless warned on this point, the owner does not connect this return of cattle to the bull with the disease known as contagious abortion; he regards it merely as a failure of the cattle to breed. As these early abortions are not uncommon in heifers, they are looked upon as a failure of the young stock to conceive, and without any further attempt to elucidate the matter the animals are put to the bull again at the earliest opportunity. In infected herds such early abortions must be regarded as due to the abortion bacillus, and the condition must not be confused with that known as temporary sterility.

How Cows are Infected.

Now the act of abortion simply indicates that all is not well with the womb, and it is disease or injury to that organ which leads to the expulsion of the calf before its development is complete. Let us, therefore, consider for a few moments the actual progress of the infecting germ from the time it enters the body of the animal. In the first place—How does it gain entry? In most cases it is picked up with the food, and cattle which graze over pastures which have been soiled with the discharges, afterbirth and aborted calf, run the risk of picking up the infection with the grass and herbage they eat. The germ is also able to pass through the skin, particularly if there is a slight wound present, and, in addition, there is some danger of the infection being transmitted by the bull during service. Generally speaking, however, grazing over the infected pastures constitutes the most common method of infection.

Udder and Womb Usually Affected.

The abortion bacillus is rather particular as to where it takes up its residence in the body of the cow. From the digestive system it passes into the blood stream. If the cow is pregnant it immediately takes up its abode in the womb and proceeds to multiply with great rapidity. If, however, the cow is not pregnant, it finds that the udder offers a more suitable home and it accommodates itself there until such time as the cow conceives. It then passes into the blood stream and is carried to the uterus. Having

arrived in the womb it not only causes disease of this organ, but also attacks the membranes covering the foetus (or young calf) and the calf itself will be infected.

As a result of the invasion by this organism certain of the tissues lose their vitality, there may be actual death of the membranes in places and the blood supply to the calf is seriously blocked, if not cut off completely. This leads to the expulsion of the calf from the mother's body. Another result is that the membranes which, during foetal life, surround and protect the developing calf are not expelled with the calf. They remain more or less adherent to the womb. Putrefaction sets in, the womb becomes infected with other micro-organisms and the owner has to deal with a case of severe inflammation of the uterus, which in some cases leads to death of the subject from blood-poisoning. Similarly, infected cows which carry a calf full time are likely to suffer from retention of the afterbirth. If the cow recovers there is always the possibility that she will prove refractory as a breeder.

From what has been said it will be realised that the sites preferred by this bacillus are the udder and the womb. Further, it might be added that the germs like these situations only when they are functioning. They do not find a suitable habitat in the womb and udder of the animal that has never bred. Hence there is no great danger of heifers contracting the disease until they are put to the bull. As soon as they are pregnant they are very susceptible to infection.

Bang's Bacillus May Cause Other Troubles.

As a matter of interest it may be mentioned here that the abortion bacillus may be associated with inflammation of joints, and scientists in other countries have recorded that they have found the germ in swellings of the knees of cattle. Recently we were successful at Glenfield in growing the germ from the enlarged knee of a cow which we knew was infected with abortion.

The bull may be the subject of infection. In this case the germ lives in the testes or the associated glands, causing the development of yellow, cheesy material in the diseased tissues. The diseased areas may sometimes be detected by feeling the organs, when nodules or lumps may be felt. Bulls so infected are frequently impotent and may be means of spread of the disease to healthy cows which they serve. Fortunately, infection of the bull is not common.

Some investigators have found the calves born alive of infected dams are very prone to suffer from disturbance of the digestive system and they regard Bang's bacillus as a predisposing, if not a direct, cause of "sour" in calves.

Also it has been recorded by other veterinarians that this bacillus had been discovered infecting horses, causing those large swellings known as fistulous withers and poll evil. Within the last week or so we had the opportunity of making a bacterial examination of a case of fistulous withers in a horse and were successful in growing the bacillus of abortion from this case.

The organism is not altogether guiltless of causing human ill-health. It is very closely related to the germ which causes Malta fever of human beings, and cases are on record where the abortion bacillus has caused a similar illness in man.

We are therefore in the position to charge this organism with the following:—

(*a*) Causing abortion in cattle.

(*b*) Causing some sterility in cattle.

(*c*) Causing loss from the necessity of treatment for secondary womb infection.

(*d*) Causing infection of joints of cattle.

(*e*) Causing disease of genital organs of the bull.

(*f*) Causing "scours" in calves.

(*g*) Causing fistulous wounds in horses.

(*h*) Having a bearing on public health.

Control and Treatment.

In view of the loss caused by this infection, the next point of importance is to consider the methods which we have at hand to control it. It is obvious that any method of control will depend upon our ability to eliminate sources of infection. Since the main source of infection is the infected animal, it follows that, provided we can discover all the infected animals in a herd, we can attempt to eradicate the disease from that herd.

All the discharges and afterbirth from an infected animal—whether she has aborted or not—and aborted calves are infectious. Hence when an abortion occurs these should be destroyed, preferably by fire.

The cow should be isolated and placed under treatment, such treatment, if possible, being carried out by an attendant who does not handle the milking herd. Unless care is taken the infection could be carried by mechanical means, *i.e.*, on instruments, clothes, hands of attendant, etc. Certainly, overalls and gum boots should be used by the person whose duty it is to douche the cow until the retained afterbirth has come away and the discharge has ceased. The infected boots and overalls should be disinfected before they leave the isolation paddock.

The cow should be douched with large amounts of weak antiseptic fluid. No strong solutions of any kind should be used. Salt solution, Condy's fluid, lysol, or other disinfectant can be used, provided it is extremely weak. Permanganate of potash (Condy's crystals) gives excellent results. It must not be forgotten that the whole of the soiled hindquarters should be washed clean of discharge and kept clean. All too frequently one sees cattle with the tail and buttocks matted with thick layers of dried pus and discharge. It is apparently not recognised that this material is teeming with micro-organisms, and for sanitary reasons should be washed off.

The cow should not go to the bull for service for at least six weeks after the discharge has ceased.

Remove Infected Cows from the Herd.

The foregoing precautions—destruction of discharges, &c., disinfection of the cow, isolation of the cow, delay of service, and so on—will, of course, deal with much of the infectious material resulting from the abortion. They do not, however, deal with it all, because it is manifestly impossible to find all the places where discharge, &c., have dropped. These must be left to the action of the sun for destruction, and until the bacilli die out they remain as possible sources of infection. Fortunately, when exposed to the direct action of the sun's rays, Bang's bacilli die rapidly. When protected in a shady, damp spot they may persist for some months. Furthermore, the foregoing precautions do not deal with the case of the cow when she aborts or calves again, since the whole process will have to be repeated, unless she is kept completely isolated from the remainder of the herd. Each subsequent parturition constitutes another new potential source of infection. It follows, therefore, that any serious attempt to control contagious abortion depends upon the complete removal of all infected cows from the herd.

The Blood Test Invaluable.

This raises at once the point of how such cows are to be selected. How is the fact that cows are infected with contagious abortion to be ascertained? Certainly, when a number of cows in a herd have actually aborted the owner can pick out these as obvious cases, but cattle which may have suffered an early abortion which was not observed, or have been infected, but have not aborted, cannot be detected by any clinical examination. These can be found by the application of a blood test.

This test selects the infected from the non-infected cattle with a great degree of accuracy. It is, however, not 100 per cent. efficient. Few, if any, biological tests are. It does not select the animal which has been infected very recently, since the anti-bodies in the cow's blood will not have developed. It does not give a positive reaction at times with recently-infected cattle until they have actually aborted. Sometimes the test is not clear cut, and the officer carrying it out may regard the reaction as suspicious but not definite. In spite of these drawbacks, the test is of inestimable value, and herds have been freed from this disease by rigid elimination of the cattle giving a positive or continued suspicious reaction.

To anyone who is considering the adoption of the Department's plan to eradicate abortion from the herd I would say: Do not enter into the plan lightly; be prepared for at least three complete blood tests of your herd; if the infection is at all widespread, your cattle may be subject to many repeated tests, because (1) your cattle are acting as traps to pick up the infection lying in the pastures, and some will react to the test later; (2) cattle recently infected may not give a positive reaction at the first test; (3) there may be some suspicious reactions and the suspects must be kept isolated until they give a clear reaction. But to those same breeders, I would also say that, in spite of the hardship and extra work, the plan is worth while, as some of our cattle-owners can testify.

The elimination of abortion reactors not only has its effect in ridding the herd of an irritating and loss-producing infection, it also has a marked effect on the breeding history of the herd from the point of view of sterility. Aborted cattle are frequently shy breeders. Where there are many abortions in the herd there are also other genital infections.

Control Methods Summarised.

The methods for the control of contagious abortion in cattle fall into three main groups.

1. The selection of all the infected animals by means of the serological (or blood) test and their immediate removal from the herd.

2. The two-herd system. In this all the infected cattle—those giving a positive blood test—are moved to a special part of the farm, so that the farmer has actually two herds, one infected and one free from abortion.

3. The herd immunity system.

The first method is the most drastic, since all cattle which give a positive reaction to the test must be immediately removed from the herd. Tests are repeated at four-weekly intervals until no further positive reactors are found. When a herd is seriously infected this method may be costly, as many animals must be disposed of at butcher's prices. It is, however, the most satisfactory method, and has been adopted by some breeders. No cattle can be introduced to the herd until the blood has given a negative reaction on two occasions.

The second method, the two-herd system, can only be adopted where it is possible to divide the herd so that the infected and the non-infected cattle do not come in contact. The cattle in the non-infected herd are tested at regular intervals, and any positive reactors are transferred to the infected herd. As, however, calves born of infected dams do not retain the infection, they can, when weaned, be transferred to the clean herd. In the course of time, as the infected cattle die or are disposed of and the young stock grow to breeding age, an abortion-free herd is obtained.

The third, or herd immunity system, depends upon the fact that cows which have aborted once rarely abort a second time, and that, therefore, after the first disaster of numerous abortions, conditions become more normal. In such a herd the virulence of the infection appears to die down and abortions in introduced cattle are not so frequent as might be expected. This system, for all intents and purposes, is that which is adopted, unwittingly, by dairy-farmers. It has many objections. For reasons not at present understood the infection may again become virulent and cause extensive loss. Heifers when bred have no immunity and are liable to abort. Similarly, newly-introduced cows pick up infection and may abort. The disease remains as a permanent infection, causing more or less continual loss. This at the time may not appear important, but the losses, in the aggregate, may be extensive. Finally, in such herds sterility is common. It has been the experience of breeders that with the eradication of contagious abortion, much of their trouble with sterility has ceased.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Tudor House School, Moss Vale	8	3 ,, 1932
Grafton Experiment Farm (Ayrshires)	193	4 ,, 1932
Hurlstone Agricultural High School, Glenfield	53	9 ,, 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 ,, 1932
Lunacy Department, Parramatta Mental Hospital	33	16 ,, 1932
Cowra Experiment Farm	32	24 ,, 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 ,, 1932
James Wilkins, "Jerseyville," Sandy Creek Road, Muswellbrook	39	28 ,, 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 ,, 1932
P. Ubrihien, Corridgeree, Bega	133	2 July, 1932
St. John's College, Woodlawn, Lismore	40	11 ,, 1932
Gladesville Mental Hospital	40	14 ,, 1932
Coast Hospital, Little Bay...	66	15 ,, 1932
William Thompson Masonic School, Baulkham Hills	45	16 ,, 1932
W. Hammond, Bellingen	68	16 ,, 1932
W. R. Boughton, Holbrook	22	27 ,, 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	81	28 ,, 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	13 Aug., 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	82	13 ,, 1932
A. L. Logue, Thornbro, Muswellbrook	41	14 ,, 1932
E. K. Winder, Wybong Road, Muswellbrook	46	14 ,, 1932
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1932
A. H. Webb, Quarry-road, Ryde	4	24 ,, 1932
E. E. McMullen, Springnook, Holbrook	32	25 ,, 1932
F. P. Perry, Nunderah, Parkville (Guernseys)	30	25 ,, 1932
Sacred Heart Convent, Bowral	10	26 ,, 1932
Department of Education, Gosford Farm Homes	38	2 Sept., 1932
James McCormack, Tumut	98	9 ,, 1932
Wagga Experiment Farm (Jerseys)	64	16 ,, 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 ,, 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1932
St. Patrick's College, Goulburn	7	21 ,, 1932
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 ,, 1932
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 Nov., 1932
Wolaroi College, Orange	11	19 ,, 1932
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1932
Berry Experiment Farm	129	26 ,, 1932
J. B. Burtenshaw, "Sunnyside," Inverell	36	27 ,, 1932
Parker Bros., Hampton Court Dairy, Inverell	74	27 ,, 1932
W. K. Frizell, Rosenstein Dairy, Inverell	44	28 ,, 1932
J. L. W. Barton, Wallerawang	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood	8	3 ,, 1932
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 ,, 1932
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	9	3 ,, 1932
A. N. de Fraine, Happy Valley Dairy, Inverell...	9	6 ,, 1932
W. Pigg, Redlands Dairy, Inverell	33	6 ,, 1932
Lunacy Department, Morisset Mental Hospital	27	7 ,, 1932
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1932
Newington State Hospital and Home	100	17 ,, 1932
W. T. Herbert, Racecourse Farm, Bega	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega	78	8 ,, 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 ,, 1933
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ..	80	22 ,, 1933
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1933
R. O. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 ,, 1933
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
New England Girls' Grammar School, Armidale	29	3 ,, 1933
Lidcombe State Hospital and Home	149	3 ,, 1933
G. L. Genge, "Easton," Armidale	33	4 ,, 1933
A. B. Finney, Fox Ground, Gerringong	29	11 ,, 1933
George Rose, Aylmerton	3	23 ,, 1933
Riverina Welfare Farm, Yanco	89	24 ,, 1933
Department of Education, Yanco Agricultural High School	39	24 ,, 1933
Mittagong Farm Homes	36	24 ,, 1933
Liverpool State Hospital, Liverpool	72	3 March, 1933
Miss Brennan, Arankamp, Bowral	17	8 ,, 1933
G. W. Young, "Boorganna," via Wingham	41	10 ,, 1933

TUBERCLE-FREE HERDS—*continued*.

Owner and Address.	Number tested.	Expiry date.
Lunacy Department, Kenmore Mental Hospital	79	27 March, 1933
P. M. Bartenshaw, Killean, Inverell	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra	20	6 " 1933
A. D. Frater, "Fairview Dairy," Inverell	51	6 " 1933
A. H. Pye, Loch Levan, Inverell	47	7 " 1933
W. Newcomb, "Minnamurra," Inverell	72	7 " 1933
Rydalmere Mental Hospital	77	7 " 1933
St. Joseph's Girls Orphanage, Kenmore	11	13 " 1933
St. Joseph's Convent, Reynold-street, Goulburn	8	14 " 1933
St. Michael's Novitiate, Goulburn	4	14 " 1933
Marion Hill Convent of Mercy, Goulburn	47	15 " 1933
G. A. Parish, Jerseyland, Berry	93	21 " 1933
Australian Missionary College, Cooranbong	64	5 May, 1933
Koyong School, Moss Vale	3	11 " 1933
Hawkesbury Agricultural College (Jerseys)	118	8 April, 1934

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.

—MAX HENRY, Chief Veterinary Surgeon.

CREAM QUALITY CONTROLS BUTTER QUALITY.

OUR knowledge of butter manufacture has increased greatly during the last few years. The most efficient machinery, churns, pasteurisers, coolers, cream vats, &c., have been developed, but the quality of the original cream is still the controlling factor of butter quality.

Although present-day methods of treatment can be expected—in fact, do, prevent rapid deterioration after treatment—still we are unable to so rejuvenate or alter the quality that a good butter can be manufactured from an inferior cream.—H. D. BARLOW in the South Australian *Journal of Agriculture.*

RECENT PUBLICATIONS OF INTEREST TO STOCKOWNERS.

RECENT publications issued by the Department of Agriculture include—

The Cattle Tick Question—A Catechism on Tick Control and Eradication.

The Control of Ked (Tick) in Sheep (Science Bulletin, No. 38).

Copies are obtainable free from the Department, Box 36A, G.P.O., Sydney.

SPEAKING recently at a meeting of dairy-farmers, Mr. E. H. Filmer, of Candelo, advised them to regulate calving so as to get some of their cows to come in practically every month of the year. This would tend to distribute production fairly evenly over the whole year and do away with the summer glut usually experienced when practically all cows come in in the spring.

Further Sheep Lick Trials at Glen Innes.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon, and
E. A. ELLIOTT, Sheep and Wool Expert.

IN the *Agricultural Gazette* for May, 1931 (page 391), a report was published giving results of sheep lick trials at the New England Experiment Farm, Glen Innes. These experiments demonstrated that for the conditions under which the sheep were run there was but little advantage in providing licks containing mineral matter and protein. The argument was raised, however, that the sheep in question (they had only been brought to New England shortly before the commencement of the trial), had not been depastured on New England for a sufficiently long time to have become affected so far as their intake of minerals and protein is concerned. The suggestion was made that possibly if these sheep had been on New England for a longer period they would have exhibited, even under the conditions existing at the New England Farm (where the sheep are run on land highly fertilised and growing improved types of grasses) the need for additional supplies of minerals and protein. Arrangements were made, therefore, to utilise these sheep in a further experiment, and the results of this experiment are indicated below, the details having been furnished by the Assistant Sheep and Wool Instructor (Mr. J. C. T. Hawkins) at the New England Experiment Farm.

Details of the Trial.

In this trial, which commenced on 28th November, 1930, two groups of sheep were provided. One lot received salt with the addition of potassium iodide at the rate of 5 oz. to the ton, bonemeal, and a proprietary mixture known as Cystin-Os, each of these ingredients being in a separate trough on the supposition that the sheep would take the amount of each ingredient required. No lick was provided for the other group. To eliminate any wastage of lick by climatic conditions, a three-sided shed was constructed, and the troughs placed in this, side by side, each trough being kept in the same position throughout the trial. No trouble was experienced with the sheep having to enter this shed for lick.

When the sheep were drafted for the current trial, those sheep which, in last year's trial, were in the "no lick" group, were again included in the "no lick" group.

As the class and quantity of feed play the most important part in the reaction of stock to licks, care was taken to see that each group received identical feed as far as practicable, and also that the same attention was given to the general management of both groups over the period.

Mating took place from 13th April to 29th May. During this time the lick trial was suspended, both groups being intermixed and depastured on natural pasture and stubble paddocks, receiving no lick whatever.

From 8th September to 16th October, 1931, lambing was in progress. In order to obtain the mothering of each lamb, which was required for a contemporary breeding experiment it was necessary to use two paddocks for each group. One day after lambing the ewe was caught, the lamb ear-marked according to the breeding of the ewe, and both were transferred to the second paddock. This continued for the greater part of lambing.

Both groups were drenched with copper sulphate and mustard six times between 15th January and 15th July, 1931. At no time did one group appear more wormy than the other.

The trial was terminated on the 4th November, 1931, and from that time on the ewes with lambs were run together, the hoggets being kept separate in one mob, so that from the 4th November to the last weighing carried out on 15th December the two groups received identical feed, etc.; no lick was given during this period.

Owing to wet weather shearing was drawn out, the ewes and lambs receiving a slight set-back, as it was necessary to hold them round the shed.

From a pastoral point of view the past year has been excellent. At no time during the trial was there a great scarcity of feed, as may be seen from the following rainfall figures:—December, 196 points; January, 172 points; February, 366 points; March, 597 points; April, 330 points; May, 354 points; June, 294 points; August, 75 points; September, 268 points; October, 255 points. The winter was particularly mild, the pastures growing right through the period, and at no time did either group receive a setback from lack of feed.

The Lambing.

Prior to lambing, which commenced in both groups on 8th September, both groups were crutched. For the first week twice as many lambs were born in the "no lick" group as in the "lick" group, the reverse being the case in the second week. At birth the lambs appeared similar, no noticeable difference being evident as to size and constitution in either group. Assistance was rendered in a number of cases, especially amongst the "lick" group. In all, eleven ewes were helped in this group, the trouble being with the large head or else with the shoulders of the lamb. Assistance was given to four ewes in the "no lick" group. In every case the presentation was correct.

In the "lick" group eight sets of twins were born, and in the "no lick" group three sets were born. None of these required assistance.

The following are the numbers of lambs born and the percentages marked:—

Group.	Number of ewes.	Lambs born.	Lambs marked.	Percentage marked.
Lick	207	208	167	80·67
No lick	203	205	168	82·75

The cause of the heavy mortality amongst the lambs between birth and marking was cold changes in the weather during lambing. In total (both groups) there were eight dry ewes.

The Weights Recorded.

During the period of the trial the sheep were weighed bi-monthly, the following being the weights of each group at each respective weighing :—

Group.	Weight at—							Gain during trial.
	27-11-30.	28-1-31.	30-3-31.	5-6-31.	31-7-31.	16-10-31.	15-12-31.	
				Ewes.				
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Lick ...	73·42	73·3	76·61	80·68	80·2	79·39	75·61	2·2
No Lick	77·13	79·15	83·6	84·74	83·26	86·35	89·62	12·5
				Hoggets.				
Lick ...	66·5	63·98	78·27	78·38	78·38	82·12	80·79	14·2
No Lick	69·0	75·3	80·37	81·75	80·27	92·91	85·88	16·8
				Lambs.				
Lick ...	31·14	41·3	49·4	52·76	50·93	62·7	68·12	37·0
No lick	32·67	44·2	52·71	52·94	50·6	69·72	71·84	39·2

Lick Consumption.

The following are the amounts of lick consumed during each month of the trial :—

Lick.	Month.									
	Dec.	Jan.	Feb.	March.	April.	June.	July.	Aug.	Sept.	Oct.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Salt	36½	16½	61	40	19	59	56	52½	40	61½
Bonemeal ...	11½	3½	0	1½	½	3½	1½	0	1½	2
Cystin-Os. ...	12½	1	3½	½	½	1½	1	1	1	1½

The total quantities of each ingredient consumed over the period of the trial were :—Salt 441 lb.; bonemeal 25½ lb.; Cystin-Os 24½ lb.

There were 353 sheep in the "lick" group at the commencement of the trial. On 16th March the wether lambs were removed, and the number on lick till the end was 277 to 266 sheep, except for the mating period, when no lick was given.

The Wool.

The wool of both lots appeared the same, being bright and attractive. Samples of shoulder wool were taken from the same sheep as last shearing, but no difference worthy of note was discernible between the different wools. The wool from both lots was soft, being nicely nourished and attractive.

The following are the average weights of the fleeces of both groups :—

	Lick Group.	No-lick Group.
Merino ewes (full mouths)	6·94 lb.	7·41 lb.
Cross-bred ewes (4-tooths)	8·53 „	8·82 „
Hoggets (2-tooths)	6·51 „	6·6 „

Comparisons and Conclusions.

Throughout this trial the "no lick" group maintained the highest average body weight. A comparison of the various bi-monthly weighings shows that the heavier weight maintained by this group is very even, except in the case of the weighing carried out on 16th October, where the sheep in the "no lick" group were heavier by 7 lb. in the ewes, 10 lb. in the hoggets, and 7 lb. in the weaners. The information obtained from the bi-monthly weighings may be taken as an indication of the condition of the sheep at the times of the different weighings.

The relationship between the body weights and the amount of lick consumed appears to be nil. The total amount of lick consumed over the period was 441 lb. salt, 25½ lb. bonemeal, and 24½ lb. Cystin-Os. These total amounts of lick consumed by the number of sheep in the group are negligible when compared with the consumption of lick in the former trial carried out during 1929–30. In that trial the amount of lick consumed varied from 323½ lb. in Group C (40 lb. salt, containing 5 oz. iodine) to 384 lb. in Group A (Cystin-Os 15 lb., salt 25 lb.), the number of sheep in each of these groups being considerably less.

Taking into consideration the number of sheep in the "lick" group and the total amount of lick consumed over the period, it appears that these sheep are not suffering from lack of any of these minerals in the diet—25½ lb. bonemeal and 24½ lb. Cystin-Os, consumed during a period of ten months by, on an average, 280 sheep, was very low.

It is quite easily seen from the small quantity of lick consumed that this could not have had any deleterious effects on the sheep, and, therefore, the difference in the body weights especially those of 16th October must be looked for in the depasturing of both groups over the period.

As regards fertility of both groups, there is very little difference, the "no lick" group being slightly better. The comparatively large number of ewes requiring assistance in the "lick" group cannot be taken as a definite indication in favour of one group or the other, as cross-breeding is being carried out here.

Of the average fleece weights obtained during shearing the "no lick" were slightly the heavier; otherwise the fleeces appeared the same.

It is questionable as to whether the differences in the above cases can be considered as significant.

Of the paddocks used during this trial only two had not received any fertiliser at any time, and one of these was used for only two days.

The variety of feed received by the "no lick" group over the lambing period seems to explain the apparent better condition and better average weight of this group at the weighing of 16th October, though every effort was made to give both groups equal conditions.

The results of this trial go to show that, where sheep are grazed on land highly fertilised and growing improved types of grasses and clovers, and also receive a diversity of feed, together with excellent pastoral conditions through out the year, the giving of a salt lick as constituted for the past trial is not warranted.

Under normal New England conditions with unimproved pastures, however, a lick is essential, and this trial should not be interpreted as indicating that licks are not required by sheep in New England.

To carry out a similar trial to the above on unimproved natural pastures in this district, the co-operation of a local grazier will be required.

Factor Potato Trials on the Lower North Coast.

Mr. J. M. Pitt, Senior Agricultural Instructor, reports the following yields obtained in the strain trials carried out last season on soils and under conditions representative of the upper and lower sections of the Macleay and Manning rivers. The season was one of the worst experienced from the point of view of rainfall.

	Sherwood (J. G. Ward).			Austral Eden (E. E. Booth).			Mt. George (C. Shields).			Dumaresque Is. (J. P. Mooney).		
Soil	Medium loam			Heavy loam			Heavy loam			Light alluvial		
Date sown	8th August.			6th August.			4th August.			1st August.		
Superphosphate per acre.	1½ cwt.			3 cwt.			180 lb.			Nil.		
				Yields per acre.								
Source of Seed Supply.	tons	cwt.	qr.	tons	cwt.	qr.	tons	cwt.	qr.	tons	cwt.	qr.
S. Jones		....		7	15	2		....		7	17	3
O. Frost		....			....			....		8	14	2
W. J. McPaul ...		....			....		5	15	3	11	3	3
G. L. Brien (Early Rose).		....			....			....		12	9	0
D. Harries		....			....			....		10	5	1
Batlow Certified B. ...		....			....			....		10	19	0
H. E. Price	3	14	1	8	5	0		....			....	
Frost Bros.		....		9	3	3		....			....	
J. T. Flood		....		8	14	1	5	13	3		....	
A. H. Price		....		6	7	0		....			....	
R. Gays		....		8	5	0		....		8	16	3
A. Price & Son ...	3	17	2		....		5	17	3		....	
E. Nugent	2	11	0		....		5	10	0		....	
C. Oates		....			....		6	13	2		....	
W. Gay	4	9	3		....			....			....	
R. Steele		....			....		5	13	3		....	
Batlow Certified C. ...	5	0	3		....			....			....	
A. Gorman	3	16	2		....			....			....	
Other strains obtained locally.	2	4	3	*10	12	1	4	10	1	†10	0	1

* [illegible]presented as well selected strain from the Northern Tab[illegible]
† Part of a quantity secured from a southern grower.

CHAMPIONSHIP COMPETITION FOR SMALL FLOCK OWNERS.

THE Department of Agriculture, the Agricultural Bureau Advisory Council, and the *Farmer and Settler* newspaper are co-operating in the promotion of district and championship Merino flock competitions among farmers who own not more than 2,000 sheep. It is the desire of the Advisory Council and the Department that steps be taken to promote local competitions in time for this year, and that all branches in the sheep-raising districts give the scheme wholehearted support.

The scheme provides for the holding of district competitions under the rules and conditions given hereunder. These local competitions will be judged by the sheep and wool instructor for the district, and the local winners will be eligible to compete for the State Championship, to be judged by Mr. J. M. Coleman, Senior Sheep and Wool Instructor of the Department of Agriculture, and for which the *Farmer and Settler* newspaper has offered a 25-guinea cup each year. For second prize this year a 15-guinea silver cup has been donated by Mr. C. B. Hearn, of the Colonial Mutual Life Assurance Society Ltd., Sydney, and for third prize Mr. F. D. McMaster, of "Dalkeith," Cassilis, has donated a 5-guinea silver cup.

The competition is not limited to Bureau branches, but is open to all farmers' organisations. However, the Agricultural Bureau should be particularly interested in the scheme, as it was really with that organisation that the idea of flock competitions as a means of improving the quality of the Merino originated. Some years ago the Gilmore branch conducted a wool competition among local farmers, and the following year changed it into a flock competition. The idea caught on, and similar competitions were held in other districts. It is now the intention of the organising committee to promote flock competitions in every sheep district.

The rules as approved by the Department and the Advisory Council of the Agricultural Bureau are as follows:—

1. The entry shall be twenty-five Merino flock-breeding ewes (fine, medium, or strong), any ages, bred by competitor and bearing his registered ear-mark.
2. Ewes entered for competition must not carry more than twelve months' growth of wool.
3. Ewes that have been agisted off the owner's holding within twelve months prior to date of judging will not be eligible to compete.
4. Ewes with lambs at foot are eligible to compete, the judge to use his discretion in appraising condition.
5. Stud-breeders who breed for sale are ineligible to compete.
6. Owners of flocks of over 2,000 are ineligible to compete.
7. Judging in district competitions will be carried out by sheep and wool instructors of the New South Wales Department of Agriculture. Judging for New South Wales grand championship will be conducted by Mr. J. M. Coleman, Senior Sheep and Wool Instructor, New South Wales Department of Agriculture.
8. Judging for local competition shall take place to suit conditions of different districts, but shall be between 1st July and 30th September of each year.
9. Entries shall close in each district not later than the second Saturday in June of each year.
10. The scale of judging points shall be as follows:—Type, 60 points; uniformity, 20 points; condition of wool, 10 points; condition of sheep, 10 points.

Charcoal Burning.

A. H. E. McDONALD, H.D.A., Director of Agriculture.

RECENT developments in the use of charcoal gas (or water gas, as it is sometimes called) as a fuel for tractors have been responsible for numerous inquiries reaching the Department for information on the burning of charcoal. The process is described briefly in this article.

Wood should be cut into lengths not exceeding 6 feet, while shorter lengths are preferable. The pieces should be from 3 to 6 inches in diameter with smaller pieces to fill in the spaces. The wood should be as straight and as clean as possible.

The site of the kiln should be level, sheltered from winds, and near water if possible. A clay loam is the best soil. A kiln of 12 feet in diameter and 5 to 8 feet high will hold about four cords of wood and yield about 1,200 lb. of charcoal.

Making the Kiln.

To make a kiln, drive a stake into the centre of the spot selected and build round this some brushwood twigs with which the fire is to be started. Next, make a flue on the ground by placing two logs 12 to 14 feet long and 8 to 10 inches in diameter parallel on the ground about 12 inches apart. These are set on the line of the prevailing wind and are " bridged over " with short pieces of wood to preserve the flue-effect when the stack is built over the logs. Then proceed to pile around the central brushwood and over the flue billets of wood standing nearly upright with a slight lean to the centre and stacked compactly. These billets should be about 2 ft. to 2 ft. 6 in. long. Pack all the spaces with small pieces of wood. Proceed then to stack wood around this until the stack is completed. When finished, the pile will be about 5 to 6 feet in height. When this stage has been reached all the crevices should be filled with small wood. At this stage the logs on the ground forming the flue should be projecting at each end about 1 foot.

The kiln is then ready to be covered but, before doing this, short lengths of wood about 18 inches long and 4 inches thick are laid radially on the ground 18 inches to 2 feet apart around the base, and on these brushwood is placed. These billets and brushwood are so placed that they reach through the outer covering of earth when it is put on, which arrangement permits air to enter the kiln at the bottom, thus aiding burning.

When covering the kiln two coverings are required. The inner one is made by thatching the stack of wood with dried or green grass or with twigs and leaves to a thickness of about 3 or 4 inches. This is then covered with sand or earth to a depth of 9 to 12 inches.

Kindling, Burning, and Removing the Charcoal.

The kiln is now ready for kindling, which is done by introducing a long firestick or torch at the end of a pole through one of the flues to the brushwood

at the centre. The kiln should be set alight on a still morning about day-break. The fire works from the top of the kiln downwards and outwards. If the burning is not proceeding satisfactorily vents may be opened or closed below the line of fire. When the flames reach the bottom of the kiln all vents must be closed with earth. During the burning the kiln must be carefully watched to see that no cracks or hollows occur, as this will cause the kiln to cave in and the whole to burst into flames, burning the wood to ash. If the covering is showing signs of forming into hollows, wood should be handy, the cover removed, fresh wood placed in, and the cover of earth replaced immediately. Before opening up, however, all vents should be closed in order to exclude air. A kiln of this kind will take from eight to twelve hours for burning and one to two days for cooling down. The cooling down may be accelerated by watering. The kiln may, however, be allowed to cool down for two weeks and the charcoal then removed.

The secret of success in making charcoal in a kiln is to have the wood well packed and the spaces filled up with small wood, while the covering should be made very compact, and during burning it should be filled in when any cracks develop.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

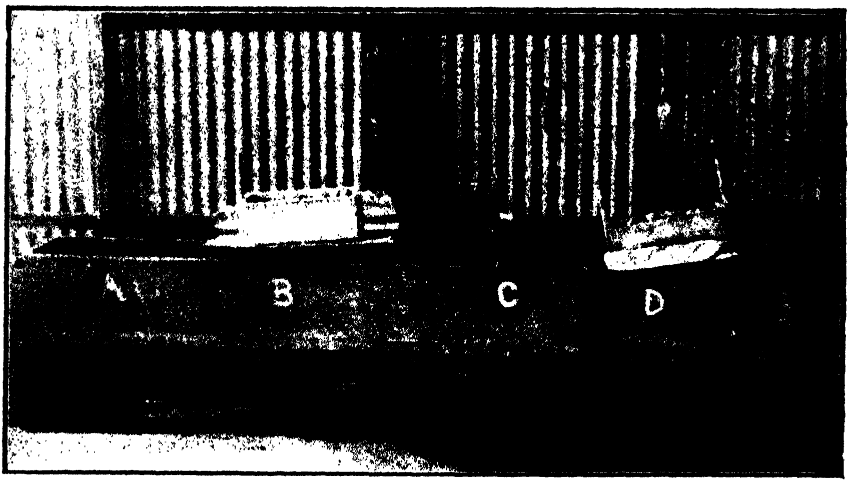
Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6,200
Swane Bros.	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

—C. G. Savage, Director of Fruit Culture.

Removal of Arsenical Residue from Apples.

J. A. BALLANTYNE, Orchardist, Bathurst Experiment Farm, and
L. S. CAYZER, B.Sc.Agr., Assistant Analyst.

THE presence of certain spray residues of a poisonous nature, *e.g.*, copper, arsenic, etc., on harvested fruits, and the possible physiological effect on humans from ingestion of the residues, have evoked inquiry and discussion for many years past. More recently, attention has forcibly been directed to the problem by the action of the British health authorities, in 1926, in forbidding the sale of fruit containing more than 1/100 grain of arsenic (As_2O_3) per pound of fresh fruit. This figure has since become known as the world's trade tolerance. Following upon this action, investigators took up the study of the problem in order to devise the best means of minimising the amount of arsenic on fruits.



Dipping and Washing Outfit used in the Experiments.

The earlier experiments overseas for the removal of arsenic were in the nature of mechanical wiping of the fruit, using various oils and other wipers, but they were expensive and accelerated decay, and the appearance of the fruit was adversely affected. Hartman and Robinson* made over 500 chemical analyses, trying numerous acids, bases and salts, in combination and alone, and finally decided that hydrochloric acid was the most

* "A Progress Report on the Removal of Spray Residue from Apples and Pears," by Robinson and Hartman. (Oregon Agric. Expt. Stn. Bul. 226. February, 1927.)

satisfactory agent for the removal of arsenical residues. It is cheap, volatile, easily removed by washing, agreeable to work with, and removes other spray residues in addition to arsenic.

Experimental work in connection with the above problem has now been in progress for a period of two years at Bathurst Experiment Farm, and although many problems still remain unsolved, much useful information has been gained. In this article the results of the more important of the tests carried out will be set out and discussed.

Method of Removing the Arsenical Residue.

In these experiments, which were carried out at a minimum of expense, and without the purchase of any plant whatsoever, ordinary wooden washing tubs were used, and although the set comprised four tubs (see illustration), only two were utilised.

The method adopted was simply to place the fruit in half-bushel cases and completely submerge the cases in the hydrochloric acid bath (see A in the illustration) to ensure that the fruit was given an even and consistent dip. The case was moved up and down in the liquid at a similar rate for all tests. From the acid dip (A) the case containing the apples was placed on a draining-board (B), so that the acid clinging to the fruit and case would drain back into the acid bath. After draining, case and fruit were submerged in the second tub (C), containing clean, running water, again handling with an up-and-down motion, as was done in the acid bath (A). From the rinsing or washing bath the case and apples were placed on a second draining-table (D), and sprayed with clean water as evenly as possible.

The Amount of Arsenic Present on Sprayed Apples.

The method adopted for the estimation of arsenic was the ordinary wet combustion process, the arsenites being titrated with a dilute solution of potassium bromate (1 cc. = ·21 mgrm. As_2O_3). Methyl orange (1/5000) was used as the indicator.

The amount of arsenic on the apples varied considerably, according to the spray programme followed out. The highest percentage of As_2O_3 remaining when harvested was in Plot 2, where the trees received five cover sprays of arsenate of lead, casein and lime-sulphur, the lowest being in Plot 5. which was given two cover sprays of lead and casein and three cover sprays of white oil alone. The outstanding point in these analyses is the fact that the Delicious apples under test, which received a calyx and five cover sprays of arsenate of lead and casein, when harvested were found to contain 8·75 times the amount of arsenic (As_2O_3) per lb. of fruit allowed by English law, and even apples which were given a calyx and two cover sprays of lead arsenate and casein, followed by three cover sprays of oil, had an excess of lead arsenate when harvested. These amounts would not necessarily remain constant from year to year with the same spray programmes. Several important

factors may affect the quantity of arsenic remaining on the apples when harvested, such as variety, method and dates of application of the sprays, time of picking, weather conditions through the growing season, etc.

TABLE 1.—Showing the spray treatments given to Delicious apples and the average amount of arsenic (As_2O_3) in grains per lb. on the fruit prior to immersion and remaining after dipping in a 2-per-cent. HCl solution for one minute at room temperature (70 deg. Fahr.).

Plot No.	Spray Treatment.		Average Amount of As_2O_3 per lb. Fruit.		
			Undipped (Check).	Dipped in 2 per cent. HCl.	Percentage of As_2O_3 Removed.
			grains.	grains.	per cent.
1	Calyx spray 1st cover spray 2nd ,, ,, 3rd ,, ,, 4th ,, ,, 5th ,, ,, 6th ,, ,,	Arsenate of lead, plus calcium caseinate.	0·0875	0·0088	89·95
2	Calyx spray 1st cover spray 2nd ,, ,, 3rd ,, ,, 4th ,, ,, 5th ,, ,,	Arsenate of lead plus lime-sulphur and casein.	0·0941	0·0054	94·26
3	Calyx spray 1st cover spray	Arsenate of lead plus casein.			
	2nd ,, ,, 3rd ,, ,,	Arsenate of lead plus casein and Alboleum.	0·0686	0·0184	73·18
	4th ,, ,, 5th ,, ,,	Alboleum.			
4	Calyx spray 1st cover spray	Arsenate of lead and casein.			
	2nd ,, ,, 3rd ,, ,,	Arsenate of lead plus casein plus Orthol K.	0·0277	0·0110	60·29
	4th ,, ,, 5th ,, ,,	Orthol K.			
5	*Calyx spray 1st cover spray 2nd ,, ,, 3rd ,, ,,	Arsenate of lead and casein	0·0163	0·0072	55·83
	4th ,, ,, 5th ,, ,,	Orthol K.			
6	Calyx spray ...	Arsenate of lead and casein.			
	1st cover spray 2nd ,, ,, 3rd ,, ,, 4th ,, ,, 5th ,, ,,	Arsenate of lead plus casein, plus Orthol K.	0·0924	0·0212	77·06

NOTE:—In all tests arsenate of lead was used at the rate of 24 oz. powder to 50 gallons water, calcium caseinate 1 lb. to 100 gallons, Alboleum and Orthol K oils 1 gallon to 80 gallons water.
* Compare Delicious Apple Table 4.

Effect of the HCl Dip on the Various Spray Deposits.

The percentages of arsenic removed from the fruit by dipping in the 2 per cent. HCl solution varied considerably, according to the spray treatment which the fruit underwent prior to dipping (see Table 1). The smallest

percentage removed was 55·83 per cent in Plot 5, and the greatest amount 94·26 per cent. in Plot 2. The average amount removed from apples of all plots was 75·09 per cent.

It will be noticed that the smallest percentages removed were in cases where oil sprays had been included in the programme, and the largest amount removed was from apples which had received a mixture of arsenate of lead and lime-sulphur. In this case, the average arsenic content of the apples after dipping was only 0·0054 grains per lb.

In Plot 1, the original apples contained a comparatively large amount of arsenic, and although dipping removed 89·95 per cent. of the arsenic, the average amount present on the dipped apples was only reduced to 0·0088 grains per lb., or 0·0012 grains less than the quantity allowed by English law. In Plot 5, only 55·83 per cent. of the arsenic was removed, but the original amount present being very low (0·0163 grains per lb.), the average amount present on the treated apples was only 0·0072 grains per lb.

Apples in Plots 3, 4 and 6, even after dipping in 2 per cent. HCl solution still contained over the maximum quantity of arsenic allowed.

These results would indicate that excessive use of oil sprays in combination with lead arsenate is inadvisable, owing to their retarding effect upon the solvent action of the acid.

Relative Cleansing Properties of Different HCl Concentrations.

Statesman variety of apples was used in this test. These apples received one calyx and five cover sprays of arsenate of lead and casein.

TABLE 2.—Showing the results of tests to determine what strength of dip is required to diminish the residual arsenic below 0·01 grains per lb. of fruit when dipped in acid for one minute at a temperature of 70 deg. Fahr. The amounts of arsenic remaining on the fruit after dipping are shown in grains per lb. of fruit :—

Apple No.	Undipped (Check).	Dipped in 3 per cent. HCl Bath.	Dipped in 2 per cent. HCl Bath.	Dipped in 1 per cent. HCl Bath.
	grains.	grains.	grains.	grains.
1	0·056	0·006	0·010	0·008
2	0·037	0·008	0·009	0·019
3	0·046	0·008	0·010	0·009
4	0·055	0·007	0·008	0 012
5	0·071	0·009	0·006	0·016
6	0·048	0·009	0·009	0·009
7	0·062	0·007	0·006	0·012
8	0·074	0·008	0·007	0·016
9	0·033	0·005	0·008	0·014
10	......	0·010	0·006	0·015
Mean	0·0536	0·0077	0·0079	0·013
Range	0·033 to ·074	0·005 to ·010	0·006 to ·010	0·008 to ·019
Percentage of As_2O_3 removed.	......	85·63	85·26	75·75

It will be noted that a 1-per-cent. hydrochloric acid solution removed 75·75 per cent. of the arsenic originally present. The amount remaining on the apples was in 70 per cent. of the apples more than the 1/100 grain per lb. When 2 and 3 per cent. hydrochloric acid was used, only 9 per cent

more arsenic was removed than when 1 per cent. acid was used. In both instances, however, the residual arsenic on the treated apples did not exceed the 0·01 grains per lb. In this and other tests it is apparent that when the 1 per cent. dip is increased to 2 per cent. greater efficiency is obtained in the removal of the arsenic, but when the acid dip is concentrated further the cleansing property is proportionately less for the additional increase in the strength of the acid.

Susceptibility of Varieties to Arsenical Deposits.

Earlier experiments carried out at the Bathurst Experiment Farm suggested that different varieties of apples retained the arsenic from the various arsenate of lead sprayings to a greater extent than others, and, in addition, when dipped in hydrochloric acid, the percentage of arsenic removed varied according to the variety.

Four varieties of apples were tested in this experiment, viz., Delicious, Statesman, Senator and Kentucky Red Streak, these being the only suitable apples available for the test at the time of dipping. The spray programme consisted of one calyx and five cover sprays of arsenate of lead (24 oz. to 50 gals.) and casein (1 lb. to 100 gals.). Excepting the calyx spray, all sprays were applied on the same dates and the apples harvested at the same time.

TABLE 3.—Showing amount of arsenic on ten apples of each variety prior to dipping, and on another ten apples of each of those same varieties after immersion in a 1 per cent. HCl solution for one minute at a temperature of 70 deg. Fahr. The results are shown in grains of arsenic (As_2O_3) per lb. of fruit:—

Apple No.	Statesman.		Senator.		Kentucky Red Streak.		Delicious.	
	Undipped.	Dipped in 1 per cent. HCl.	Undipped.	Dipped in 1 per cent. HCl.	Undipped.	Dipped in 1 per cent. HCl.	Undipped.	Dipped in 1 per cent. HCl.
	grains.	grains.	grains.	grains.	grains.	grains.	grains.	grains.
1	0·081	0·007	0·060	0·008	0·057	0·012	0·067	0·013
2	0·067	0·008	0·060	0·014	0·049	0·011	0·065	0·011
3	0·082	0·015	0·065	0·010	0·043	0·011	0·072	0·006
4	0·057	0·007	0·058	0·009	0·037	0·004	0·081	0·009
5	0·054	0·010	0·057	0·007	0·046	0·009	0·097	0·007
6	0·080	0·012	0·051	0·007	0·045	0·009	0·061	0·006
7	0·046	0·005	0·061	0·008	0·047	0·007	0·078	0·011
8	0·087	0·010	0·064	0·021	0·039	0·007	0·079	0·008
9	0·058	0·010	0·047	0·009	0·026	0·010	0·054	0·013
10	0·098	0·007	0·053	0·007	0·048	0·008	0·070	0·006
Mean	0·071	0·0091	0·0576	0·010	0·0437	0·0088	0·0724	0·0090
Range	0·046 to ·098	0·005 to ·015	0·047 to ·065	0·007 to ·021	0·026 to ·057	0·004 to ·012	0·054 to ·097	0·006 to ·013
Percentage of As_2O_3 removed.	......	87·18	......	82·64	......	79·86	......	87·57

The amounts of arsenic on the four varieties (Table 3) varied considerably. The average amount on the undipped Kentucky Red Streak apples was 0·0437 grain per lb., Senator 0·0576 grain per lb., Statesman 0·0710 grain per lb., and Delicious 0·0724 grain per lb. If the amount present on the Kentucky Red Streak be taken as 100, the amounts on the other varieties would be Senator 131·8, Statesman 162·5, and Delicious 165·7.

The percentages of arsenic removed by dipping also varied considerably—Kentucky Red Streak 79·86 per cent., Senator 82·64 per cent., Statesman 87·18 per cent., and Delicious 87·57 per cent. Notwithstanding these marked differences, the result after dipping was approximately the same in all varieties, the variation being only from 0·0088 to 0·010 grains per lb., which is not significant.

Effect of Wax Produced during Storage on Removal of Residue.

Two varieties, Delicious and Statesman, were used in this test, the object of which was to ascertain the effect of wax produced as a result of storage on the amount of arsenical residue which can be removed.

The spray treatments were as follows :—

Delicious.—One calyx and two cover sprays of lead arsenate and casein and three cover sprays of Orthol K and casein.

Statesman.—One calyx and five cover sprays of lead arsenate and casein.

Thirty apples of each variety were taken for the test. Ten were left undipped, ten dipped in a 2 per cent. HCl solution immediately after picking, and ten dipped in the same strength acid ten weeks after picking. The acid dip was at room temperature (70 deg. Fahr.).

TABLE 4.—Showing amounts of arsenic remaining on apples dipped in a 2 per cent. HCl solution immediately after picking and after storage. The results are shown in grains of arsenic per lb. of fruit :—

Apple No.	*Delicious.			Statesman.		
	Undipped (Check).	Dipped in 2 per cent. HCl on 2/3/31.	Dipped in 2 per cent. HCl on 14/5/31.	Undipped (Check).	Dipped in 2 per cent. HCl on 2/3/31.	Dipped in 2 per cent. HCl on 14/5/31.
	grains.	grains.	grains.	grains.	grains.	grains.
1	0·023	0·009	0·015	0·055	0·007	0·027
2	0·021	0·011	0·011	0·062	0·009	0·031
3	0·014	0·008	0·017	0·062	0·010	0·029
4	0·024	0·006	0·012	0·037	0·009	0·022
5	0·018	0·010	0·011	0·044	0·006	0·024
6	0·017	0·008	0·012	0·054	0·012	0·023
7	0·017	0·008	0·010	0·075	0·007	0·018
8	0·018	0·010	0·013	0·070	0·007	0·030
9	0·026	0·007	0·011	0·087	0·007	0·024
10	0·011	0·009	0·010	0·079	0·007	0·021
Mean	0·0189	0·0086	0·0122	0·0625	0·0081	0·0249
Range	0·011 to ·026	0·006 to ·011	0·010 to ·017	0·037 to ·087	0·006 to ·012	0·018 to ·031
Percentage As_2O_3 removed.	......	54·49	35·45	......	87·04	60·16

* Compare Table 1.

The effect of storage before dipping is to reduce considerably the amount of arsenic which can be removed by the dip. In the Delicious apples the percentage of arsenic removed was reduced from 54·49 to 35·45 per cent., and in the Statesman variety from 87·04 to 60·16 per cent. This difference is traceable to production of wax on the stored apple, which hinders the action of the acid.

In both cases dipping immediately after picking reduced the arsenic to an amount below the world's tolerance limit. Dipping after storage is unsatisfactory in this respect, the amount remaining on the apple being well over the limit.

Effect of Acid Treatments on Keeping Quality of Apples.

Experiments carried out with Senator, Statesman, Kentucky Red Streak, Delicious and Gano apples show that, if the fruit is intact and free from broken skin, little detrimental effect will result from the dipping of apples in HCl acid concentrations up to 4 per cent., always provided that care is taken to ensure that the fruit, after immersion in the acid, is thoroughly washed. Careless cleaning methods will result in injury to the fruit.

Statesman apples dipped in 4 per cent. HCl acid, followed by draining one minute, rinsing in clean running water 2 minutes, and hosing for twenty seconds, showed no effects from the acid dip. The same variety of apple, also dipped in the 4 per cent. HCl acid, but which received no subsequent treatments, was badly burnt and spotted, 55 per cent. having to be discarded one month after treatment.

Apples with broken skin or punctures, when dipped in the acid solutions show discolouration and burning of the exposed and surrounding flesh. In the case of small punctures, codling moth stings, for example, the burning or light brown discolouration is confined to a circular area extending about ⅛ inch around the puncture. Later the affected portions become darker in colour, sunken and dried up, but this does not interfere with the keeping quality of the apples. Apples with open calyx tubes will often show the burning to extend along the length of the calyx tube to the core and cells, but the discolouration does not extend any distance into the flesh and the burnt areas dry up, and storage of the affected apples is not interfered with.

If the dipping in the acid has not been for an extended period, 1, 2, 3 or 4 per cent. hydrochloric acid will not affect fruit showing bitter pit, Jonathan spot, water core, or russeting.

Summary.

1. Experiments have been carried out for the removal of arsenical residues from apples, and the effect of the hydrochloric acid dips on the keeping quality of the apples has been observed.

2. The spray programme has a pronounced effect on the amount of spray residue on the fruit and on the percentage of residue which can be removed in the hydrochloric acid dip.

3. Where oil sprays have been included in the spray programme as a substitute for the later covers of lead arsenate, less arsenic is present on the harvested apples. In all cases where oil sprays have been used, less arsenic can be removed from the fruit.

4. The arsenical residue on apples which have received as many as six sprayings of lead arsenate can be reduced to an amount within the world's tolerance limit by dipping in 2 per cent. HCl.

5. At a temperature of 70 deg. Fahr., 1 per cent. hydrochloric acid is not suitable for the removal of the residue. Two per cent. acid is satisfactory, but any further increase in strength does not result in a proportional advantage.

6. Certain varieties of apples which have had identical treatment in the field, when harvested, differ considerably in the amounts of arsenical residue present on the apples.

7. The wax formed on the apples during storage hinders the solvent action of the acid. Apples should be harvested at the correct stage and dipped immediately.

8. Dipping is not detrimental to the keeping quality of the apples if care is taken during the operation and the fruit is undamaged. Apples with open calyx tubes are susceptible to burning along the length of the calyx tube.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1932:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ...	563,212	56,182
Tomatoes ...	31,963	...
Bananas	45,921	...
	bunches.	
,, ...	1,874	...
	cases.	
Pineapples ...	66,812	...
Melons	104	...
	lb.	lb.
Canned Fruit ..	93,492	9,240
Dried Fruits—		
Unspecified ...	8,652	10,640
Currants ..	4,900	...
Raisins ..	6,244	...
Apricots ...	1,624	...
Apples ...	1,400	...
Peaches ..	1,008	...
Pears	616	...
Prunes ...	1,596	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples .	... .	..	1,043
Bananas ...	....	6,999	1
Lemons ...	....	...	27
Oranges ..	....	12	5,437
Grape Fruit ...	....	78	2
Pears	.. ..	...	850
Pineapples ...	....	...	1,336
Other	....	254	2,424
Dried Fruits—		lb.	lb.
Apples ...	....	...	628
Apricots ...	....	...	3,208
Currants	....	...	37,680
Figs	China	40	...
,, ...	Turkey	1,037	...
Peaches ..	....	...	48
Prunes ..	....	...	1,983
Raisins—			
Sultanas .	....	...	121,908
Lexias ...	....	...	56
Other ..	....	...	2,105
Dates	....	...	8,993
,, ...	Iraq	146,443	...
,, ...	Mesopotamia ...	429,554	...
Other	China	1,541	1,675
Preserved in liquid—			
Apricots ...	....	...	60,353
Peaches ...	....	...	141,710
Pears ..	....	...	10,837
Pineapples ...	....	...	3,404
Raspberries	....	...	4,162
Other ..	....	...	14,911
		Gallons.	
,, ...	....	91	...

Farm Produce Agents Act Amended.

J. R. BUTLER, B.A., Registrar, Farm Produce Agents Act.

THE Farm Produce Agents Act passed in 1926 was aimed to place agents who sell farm produce under certain control and to give to growers a degree of protection. During the past five years the Act has proved to be of great value, and the benefits given to growers under it have amply justified the measure. It has been found during that five years, however, that the Act needed tightening up in certain respects. This has been done by the Farm Produce Agents (Amendment) Act, 1932, which became law on 15th April, 1932.

Prior to this amending Act many persons removed themselves from the scope of the Act by trading as merchants. Although the form of trading adopted by these merchants might have appeared to growers to be for their benefit, in many ways it had obvious disadvantages. The usual arrangement was for the grower who sent his produce to the merchant to agree to accept the merchant's "highest price as on day of receipt." The fixation of this price was left entirely to the discretion of the merchant, and the grower was unable to ascertain either through the Department of Agriculture or otherwise what the highest price was. Should, therefore, any grower feel that he had not been paid an adequate price for his produce, he had no means of ascertaining whether he had or not. Furthermore, in the event of any merchant failing to pay for produce consigned, the chance of recovering payment was made very remote by reason of the fact that the grower was unable to establish the amount to which he was entitled.

By the amending Act merchants are prohibited from purchasing farm produce from the producer thereof unless at the time of purchase or before delivery, whichever is the earlier, the purchase price has been definitely fixed and agreed to by the producer at a certain sum of money, without reference to a market price or to the highest price on the day of delivery, as was the former practice. The merchant, subject to these conditions, may purchase farm produce direct from the producer, but in such a case he must keep certain prescribed books showing the purchase price and the sale price of the produce.

One of the most important provisions of the Act is that an agent before he can become licensed must furnish a bond. Should an agent then default in payments to his consignors, the Department could, as it has done frequently, recover the amount from the insurance company which furnished the bond. The amending Act has prohibited merchants from carrying on their business in their former manner, and most of these have now registered under the Act.

The manner of trading in farm produce will thus be uniform, growers will have the benefit of Departmental supervision over agents' business affairs, and they will have the protection given by the bond.

The amount of the bond has been increased, being now £1,000 in the case of an individual, and £2,000 in the case of a firm or corporation. Many agents in the country sell only by auction, and the amount of their business is not large. The amount of the bond in such case has, therefore, been fixed at £300, which should provide ample security. Co-operative societies which sell the farm produce of other growers as well as members are now required to register.

Agents are required to furnish an account sale together with payment within fourteen days after the sale of the produce. The agent is entitled to deduct his out-of-pocket expenses and commission at the rate of 7½ per cent., or, if he chooses, in the case of fruit 2d. per quarter bushel case, 4d. per half bushel case and 6d. per bushel case.

Another important amendment is that relating to the destruction of farm produce. Agents are now not permitted to destroy farm produce unless with the written authority of a health officer, officer of the Municipal Council of Sydney, or a Fruit Inspector of the Department of Agriculture. Growers should see that, when their produce has been shown on any account to have been destroyed, the certificate issued by the proper officer has been furnished. In practice, this certificate should be forwarded by the agent to the grower.

Other provisions of the Act provide for heavy penalties for the rendering of false or fraudulent accounts, and generally growers dealing with registered agents are placed in a much more secure position.

Growers are reminded that the Act is for their benefit, and in their own interests they should advise the Registrar immediately if they are dissatisfied with the dealings of any agent, and such matters will receive prompt attention.

Farm Mortgage Debts in U.S.A.

A recent survey by the U.S.A. Department of Agriculture reveals that 38 per cent. of all mortgaged farms in the United States were mortgaged for more than half their value as on 1st January, 1931. More than half of all farms were free of mortgage, but relatively fewer farms were free of debt than four years ago. Of the mortgaged farms 25 per cent. were, in 1931, mortgaged up to 25 per cent. of their value, 37·3 per cent, for between 25 and 50 per cent. of their value, 22 per cent. for between 50 and 75 per cent. of value, 10 per cent. between 75 and 100 per cent., and 5 per cent. for more than 100 per cent. of their value.

"Much can be accomplished when there is desire, knowledge, and willingness to work, even though there is little or no money to spend."

Orchard Notes.

JUNE.

C. G. SAVAGE and R. J. BENTON.

Handling the Citrus Crop.

DURING June citrus growers will enter on the busy harvesting and marketing season. Unfortunately, there are still some growers who fail to realise the necessity for attention to details in all operations connected with the handling and preparation of their fruit for market. Generally, their excuse is that it is necessary to cut costs to a minimum, but it is false economy first to spend money on fertilisers, the control of pests and diseases, and, generally, on bringing the crop to maturity, and then to sacrifice all the advantage gained by these up-to-date cultural methods simply through ignorance or want of appreciation of the benefits to be derived from efficient handling and marketing methods.

Some Important Picking Hints.

Careful handling must commence with the harvesting of the fruit and continue until the fruit becomes the property of the buyer. Clipping is preferable to pulling oranges from the trees. It is often not possible when harvesting to clip the stalk close up to the calyx or button, in which case a second cut should be made after the fruit is removed from the tree. Cutting the fruit stalk flush with the button, at the same time leaving the latter intact on the fruit, is very important, because if the stalks are left long they are liable to puncture the skins of other fruit both in the picking bag and in the case when packed.

Care should also be taken when placing the oranges in the picking bag. On no account drop them in on top of the other fruit, as this causes bruising of the skin and adversely affects the keeping quality of the fruit. Any factor that impairs keeping quality should be guarded against, particularly if the orchard is a considerable distance from the market, but also, in other cases, because even after the fruit reaches the market sales might be slow, necessitating the holding of the fruit for some days. Moreover, fruit of poor keeping quality soon becomes known to buyers, who invariably pass it over. To clear such fruit, it has to be offered at lower prices, which fact tends to depress the prices of all other fruit on the market.

Packing and Stacking.

Fruit sizers are in very general use now. These greatly facilitate packing, which, on the whole, has shown considerable improvement during recent years. Growers who are not prepared to pay the price asked for sizing machines should certainly construct one for themselves. Full particulars

are given in a free leaflet issued by the Department of Agriculture, Box 36A, G.P.O., Sydney. Charts and diagrams for the packing of oranges can also be obtained from the same source.

Though it is very necessary when packing to provide for a slight spring, or bulge, on the top and bottom boards, this should not be overdone, especially with cases having heavy tops and bottoms, as these "give" very little, and consequently an excessive bulge will result in bruising of the fruit.

It is also very important when stacking cases that they be placed on their sides so that the weight of the cases above does not come on the spring or bulge, as this also would cause bruising. This point is just as important with hinged-lid cases as with those having nailed-down lids.

Plough Early.

Where the orchard has already been given an autumn ploughing and the soil has not since become compacted or overrun with weeds, the second ploughing may be delayed, otherwise it should be commenced in time to complete the work before the end of July. This is important in order to ensure that any green material turned under is given time to rot and so make available again to the fruit trees the plant foods which it "locked up" during the process of rotting. It is very important that these plant foods should be available to the trees when they begin to grow in the early spring.

Another very good reason for early ploughing is that it guards against the weeds or green manure crop competing with the trees for soil moisture. If the ploughing is delayed and the season turns out dry, the trees are liable to suffer unless water is available for irrigating. Furthermore, early ploughing puts the soil in a condition to absorb readily any rain that falls.

Oranges for Export.

With the certainty of a large crop of oranges this season and prospects of a depressed local market, growers having fruit of suitable quality for export might find it more profitable to ship to Great Britain. This is most likely to prove so with Valencias and varieties of common oranges. Although prices on the English market do not promise to be high, there are other factors which should operate in our favour. For instance, the exchange rate is likely to continue to the disadvantage of our main competitors, California and South Africa.

Harvesting Lemons.

A good main crop of lemons is now maturing. In view of the fact that a more satisfactory market will be available for lemons in the spring, the most suitable fruit should be harvested before too mature and stored. By suitable fruit is meant that which is green in colour and about 2⅜ or 2½ inches in diameter, being well-shaped specimens from normally healthy trees. Provided the lemons are clipped from the trees and handled carefully and whilst quite dry, there should be very little loss from blue mould. The only other

decays likely to occur during the four months the lemons are stored are those of the stem end decay type, but these can be greatly minimised by harvesting fruit intended for storing before it begins to "yellow," and as far as possible storing fruit clipped only from leafy twigs.

After the lemons have been stored for some weeks too free access of air should be prevented, and efforts made to maintain a fairly high degree of humidity in order to guard against excessive wilting and shrinking.

Peach Leaf Curl.

Extensive field trials conducted by the Department of Agriculture have shown that peach leaf curl is easily and effectively controlled by spraying, either by Bordeaux mixture or lime-sulphur at winter strength, provided—and this is the important point—the spraying is carried out while the trees are still dormant but just before the buds swell. Judging by the number of inquiries concerning leaf curl control that reach the Department in the early spring, when it is too late to treat the disease, there are still many growers ignorant of the Department's recommendations.

When treating peach trees for leaf curl, care should be taken to cover every above-ground part of the trees, especially the extremities of small limbs and twigs, with spray.

Experiments have shown that in some districts 6–4–40 Bordeaux mixture, which is weaker than winter strength, will control the disease. In isolated cases growers have found it necessary to spray twice for peach leaf curl control, one application being given just before the buds swell and the second when the flower buds are showing colour. Such cases, however, are rare.

A leaflet on peach leaf curl is available gratis from the Department of Agriculture.

The Action of Air on Washing Soda.

During last season in the Gosford district a certain amount of "burn" of citrus trees that had been sprayed with mixtures containing washing soda was experienced. As the soda had been exposed to the air for some time before use it was thought this might have been responsible for the damage, and the question was submitted to the Chief Chemist of the Department, who furnished the following explanation:—

"Washing soda contains approximately 63 per cent. of water of crystallisation. When exposed to the air the compound loses water and falls to a white powder. The amount of water lost depends on the temperature, the humidity, and the length of time of exposure. With humidities approximating 80 per cent. of saturation with aqueous vapour, the loss of weight would approximate 20 per cent. Under these conditions each 100 lb. of washing soda crystals would be equal to 80 lb. of the white powder. In the case of humidities of 30–40 per cent. of saturation the loss of water is greater and the loss of weight would approximate 31½ per cent. Under these conditions 100 lb. of washing soda crystals would be equal to 68½ lb. of the

white powder. The storage of washing soda crystals in air-tight containers would be advantageous, and is essential if concordant results are to be obtained. There is no reason why the dry or water-free sodium-carbonate, known as " soda ash," should not be used in place of washing soda crystals, 100 lb. of washing soda crystals being equal to approximately 37 lb. of soda ash, or 10 lb. washing soda crystals equalling 3 lb. 12 oz. of soda ash. If much soda is used the saving in freight would be appreciable if soda ash were substituted for washing soda crystals."

While from the point of view of chemical composition there is no reason why " soda ash " should not replace ordinary washing soda in a spray, it is pointed out that the Department has not so far carried out field tests with " soda ash." However, arrangements have been made to carry out laboratory and field work for the control of white and red wax scale in the Gosford district, when " soda ash " will be tested along with other materials.

Inspection of Fruit, Plants, etc., at Queensland Border.

Several cases have recently come under notice where importers of fruit, vegetables, etc., by road from Queensland have failed to arrange for the produce to be inspected at the border, with the result that they have been prosecuted and substantial fines inflicted.

It is, therefore, desired to draw the attention of importers to the fact that under the provisions of the Plant Diseases Act the introduction of fruit and plants (including vegetables) into this State from Queensland is prohibited, unless notice of the arrival of such produce is given to the Department's Inspector within twenty-four hours after its arrival at the place of entry, and a permit for its importation is obtained from him. Failure to comply with the law in this respect renders the offender liable to a heavy penalty. The places of entry for fruit, vegetables, etc., by road from Queensland are Tweed Heads and Wallangarra, and the Inspectors at those centres are Mr. A. C. Green, Boyd's Bay Ferry, Tweed Heads, and Mr. S. C. Todd, Railway Station, Wallangarra.

An Appeal for Unity in the Banana Industry.

The remarkable success that has attended the production side of the banana industry in the short period that has elapsed since its rehabilitation makes it deserving of more consideration at the hands of those co-operative bodies which claim to be watching the growers' interests. The aphorism, unity is strength, applies to the banana industry just as much as to any other section of the community, writes Mr. H. W. Eastwood, Fruit Instructor, Murwillumbah, who is mildly critical of the friction that exists between the two co-operative organisations, each of which is striving to outdo the other although both are catering for the growers' needs and offering practically dentical inducements.

The united efforts of banana growers are very necessary at the present time for overcoming the obstacles still in the way of complete efficiency and effective progress. With a duplicate service, as is in existence to-day, the industry—and consequently individual growers—is not only divided, but is called upon to finance two co-operative concerns, whereas, if true co-operation really existed, one organisation would be able to cater just as efficiently for the whole industry at little more than half the present cost of the two. That both bodies have been successful in their respective spheres is freely admitted, a fact which makes it all the more obvious that an amalgamation of the two bodies would be of incalculable benefit to the growers.

[Latest advice suggests that an early amalgamation is the aim of both bodies.—EDITOR.]

The Benefits of Unified Marketing.

The following paragraph, illustrating the benefits of undivided effort in the marketing of citrus fruits, is taken from the *California Citrograph* (U.S.A.): –

Unified marketing of the Florida citrus output, sponsored by the U.S.A. Federal Farm Board, has, as its principal objective, a system that will ensure growers better net returns on their investment and labour. Because it will mean immensely greater sums of money placed in trade channels, the unification of citrus selling is almost as important to business and professional men as it is to growers.

California has unified marketing in that the growers' co-operative organisation controls approximately 75 per cent. of the citrus output, with the remainder handled by a comparatively small number of independent agencies. Florida has lacked unification in marketing, her growers' co-operative handling only about 33 per cent. of the citrus crop, and nearly 150 outside concerns competing with each other in selling the other 67 per cent.

During the 1928–29 season, California shipped 88,010 carloads of citrus sold f.o.b. for $118,874,102. Florida shipped 62,877 cars, sold f.o.b. for $54,844,805. Forty per cent. more fruit returned California growers 116 per cent. more money. Unified citrus marketing will do relatively as much for Florida as it has for California; that's why the Federal Farm Board recommends it.

Papaw Often Erroneously Called Pawpaw.

The correct name of the tropical fruit *Carica papaya* is papaw or papaya, and not pawpaw. It may come as a surprise to most readers to learn that the papaw and the pawpaw are entirely different fruits. The papaw (*Carica papaya*), so well known on the far north coast of New South Wales, is a tropical fruit, while the pawpaw (*Asimina triloba*) is a comparatively little known sub-tropical fruit and, according to Fraser, in *American Fruits*, is related to the soursop and custard apple.

A PHENOMENAL YIELD OF JAM MELONS.

WRITING to the Department on 3rd April, Mr. C. W. Smith, of Cooma, stated that he had a jam melon vine (Red Seeded Citron variety) with fifty melons on it, each melon weighing about 10 lb. The seed from which the vine grew was nine years old.

Poultry Notes.

June.

E. HADLINGTON, Poultry Expert.

Fumigate the Incubators.

At the beginning of this month a start should be made with incubation, and some thought should be given to the matter of disinfection. One of the best means of disinfection is fumigation with formaldehyde gas, which is generated by adding formalin to permanganate of potash crystals. The quantity of each required for every 20 cubic feet of incubator space is ⅛ oz. permanganate of potash and ¼ oz. formalin.

The permanganate crystals should be placed in a fairly wide china or earthenware vessel to avoid overflowing by effervescence when the formalin is added. The vessel containing the permanganate crystals should be placed in the incubator and the formalin added, and the door of the machine then closed quickly, taking care not to inhale the fumes.

Any ventilators in the incubator should be closed prior to fumigation and it is advisable to leave the machine closed for a few hours. On no account should the crystals be added to the formalin owing to the risk of an explosion.

Prior to fumigation it is advisable to scrub the trays and any other parts of the incubator which may be soiled, using a disinfectant solution for the purpose.

Selecting Eggs for Incubation.

The necessity for careful selection of eggs for incubation cannot be too strongly emphasised. All eggs used should be at least 2 oz. in weight, and although early in the season there is a temptation to put in eggs which do not come up to the desired standard, it is better to let the incubators go slack than to put in unsuitable eggs. The guiding factor in selecting eggs should be to use only those which are as near to normal as possible in shape, texture of shell, etc. All those with thin, uneven, and porous shells should be passed out, also those which are under 2 oz. in weight, as well as the unduly large ones.

Particular care should be taken with regard to the rejection of small eggs, because strong stock which will in turn lay large eggs cannot be expected from undersized eggs, which are an indication of weakness. The aim must be to build up our flocks and maintain stamina to withstand the strain of high production, and the selection of the right class of eggs for incubation is one step in that direction.

Keeping Eggs for Hatching.

Poultry farmers with only a small flock often find it difficult to fill up an incubator early in the season without the eggs becoming somewhat stale, but rather than wait for sufficient eggs to fill the incubator it would be better only partly to fill the machine with eggs not more than a week old, because the longer the eggs are kept over that age the less is the chance of a successful hatch. If, however, eggs have to be kept longer than a week, they should be placed in a box, covered with bran and turned once or twice daily. If the eggs are so packed that they will not move about in the box, the turning can be done by turning the box over. Eggs being kept for incubation even for a few days should be covered over or kept in boxes with lids on to prevent undue evaporation, and also later in the season to protect them from the variations of temperature, such as are experienced when the nights are frosty and the days very warm. The room in which eggs are stored should be as even in temperature as possible, airy and yet not draughty, and be free from strong odours. These matters all tend to make a difference in the hatching results, yet on many farms no consideration appears to be given to them.

Attention to Incubators.

Testing Thermometers.--At the beginning of each hatching season it is advisable to test all thermometers because they sometimes get out of order. The fact that they worked satisfactorily for one or more seasons does not ensure that they will continue to register correctly. The best method of testing them is to take a dish of warm water at a little over 100 deg. Fahr., stand all the thermometers in at the same depth, and allow them to remain in for a couple of minutes. If a tested thermometer is available it should be put in with them and any that vary from it will be wrong. But failing a tested thermometer it can be taken that if the majority register the same they are correct and those which differ are wrong.

Regulating Device.—The next important part of the incubator to look to is the regulating apparatus, which in some machines is a thermostat, while in others it is capsule. The thermostat consists of sensitive metal bars so arranged that by expansion or contraction they operate a disc which opens or shuts according to the temperature. These bars are not likely to get out of order unless strained or broken at the centre. Therefore, all that is necessary is to examine them to see that they are in good condition. With a capsule, a simple method of testing is to remove it from its bracket and hold a lighted match underneath and about 2 inches away. If it is in order it will quickly expand, but if the expansion spirit has leaked out it will remain flat, in which case a new one should be obtained.

The regulating device should not be regarded as entirely self-regulating, and adjustments are necessary to meet the outside fluctuations of temperature.

The Lamp.—Before starting the season all burners should be thoroughly cleaned, and the best method of cleaning is to take out the wicks and boil the burner in soap and water to which a little washing soda has been added. New wicks should then be put in. The wicks and burners should be cleaned every day, preferably late in the afternoon, so as to ensure a safe burning light through the night.

A good method of cleaning is to put out the light, open the top, and turn up the wick about half an inch, remove any crust that may have formed on it, then turn the wick well down and brush the burner sleeve with a small brush such as a tooth brush, or if a corrosion is forming remove it by scraping with a blunt knife. Then turn up the wick a little above the level of the sleeve and press it level with the fingers, at the same time rounding the corners. Next, light the wick and if the flame does not burn evenly dab the uneven part of the wick with the fingers until a good, somewhat rounded flame is obtained. In all burners will be found a small vent alongside the wick sleeve and it is important that this be kept clear, otherwise there will not be proper combustion. Another matter which will affect the evenness of the light is any dents in the burner cap, or wick sleeve.

Renewing Diaphragms.—In machines which have hessian frames in the bottom these should be re-covered with new hessian, and if there is also hessian diaphragm in the top, this should be examined and if it is found that the meshes of the hessian are very open it should also be renewed.

Working Instructions.

Heating Up.—When starting the incubator the temperature should be raised to 103 deg. Fahr. and maintained at that for about twelve hours before putting in the eggs. After the eggs are put in it is as well to allow another twelve hours for them to become heated through before attempting to regulate the temperature. After this the temperature should be regulated to run steadily at 102 deg. Fahr.

Temperature.—The temperature should be kept at 102 deg. Fahr. during the first week and then at 103 deg., continuing at this until the eggs begin to chip, which may occur as early as the nineteenth day. The temperature can then be allowed to run up to 104 deg. or even 105 deg. until the hatch is finished. The bulb of the thermometer should stand just clear of the eggs; about half an inch above is the correct position.

Turning.—The eggs do not require turning for the first thirty-six hours, after which they should be turned twice daily up to the ninth day at least, but afterwards once per day is all that is absolutely necessary. There is no harm, however, in turning them twice a day right through till the time of chipping, when turning should cease.

Testing.—The eggs can easily be tested about the sixth day, when, with a good tester, it is quite easy to pick out the infertile eggs. A simple method for testing on a small scale is to make a hole in the wall on the sunny side of the incubator room to which the eggs can be held for testing. It is a good

plan to place a sheet of glass over the outside of the hole, and it is necessary to darken the room during the operation. Where large numbers have to be tested, an electric light can be fitted in a dark box, and two holes made to hold the egg against. In this case also the room should be darkened.

Cooling.—After the sixth day cooling of the eggs should commence, allowing them to stand out of the incubator for a few minutes at first, and then gradually increasing the time of cooling as the hatch progresses, so that towards the end of the hatch they are allowed to cool for fifteen to twenty or even thirty minutes, including the time of turning, according to the temperature of the room. They should not, however, be cooled for thirty minutes as a regular practice, and cooling should cease when the first egg is chipped.

Ventilation.—Up to the sixth day, little if any ventilation is required; after that time, in an incubator where the ventilation can be controlled, the ventilator should be gradually opened as the hatch progresses, and closed again at the first sign of chipping. In the case of a large hatch it may be found necessary to open the ventilators again somewhat when the hatch is practically over to allow more air for the chickens. If an incubator is not over-ventilated no applied moisture is necessary, because if the moisture in the egg is conserved there is sufficient to ensure successful hatching.

Hatching Time.

After chipping commences, the door of the incubator should not be opened except in case of emergency. If an exceptionally good hatch is coming off and the chickens are crowding unduly on the trays and appear likely to become smothered, the door can be opened and some of the chickens taken out, otherwise, apart from keeping the temperature at the right level, the machine should be left alone until the hatch is completed. The mistake should not be made of leaving the chickens in the incubator too long after hatching, and as soon as the hatch is over the remaining eggs and shells should be taken out and a little extra ventilation allowed. This can be effected by wedging the door open slightly with a piece of paper, but the temperature should be kept at about 100 deg. Fahr. Many chickens are harmed by leaving them in the incubator too long without proper ventilation. Shortly after all the chicks are properly dried off they can be taken out, and in removing them to the brooders care should be exercised to see that they do not become chilled. A shallow flannel-lined box is best to use for transferring the chickens to the brooders.

"Dead in the Shell."

The question is often asked as to the cause of the "dead in the shell," and in many cases all manner of causes except the right ones are suspected. Certainly, it is often difficult to arrive at an exact solution of the trouble, but a few common causes may be given which should be considered when an undue percentage of "dead embyros" is experienced. It must be understood, however, that some "dead in the shell" is inevitable, because there are always weaklings before as well as after hatching.

If the incubator has been run properly and no experimentation has been indulged in, other causes may be looked to. One of the first matters to consider is the condition of the breeding stock, whether they are physically sound and in good condition or whether the male bird is getting light, or is infested with vermin. It frequently happens that the male bird allows the hen to get most of the food and of course he becomes poor. For this reason it is a good plan to give him a feed by himself in the middle of the day.

The feeding of the birds is also often responsible for the trouble in so far as they might be over stimulated by getting too much protein or condiments. Again, they might be surfeited with food, or the reverse might be the case. Careful feeding is essential to secure the best results in hatching and the effects of faulty feeding may be noticeable for some months; therefore, the method of feeding in vogue long before the eggs are laid must be taken into consideration. Another important factor is the age of the eggs, which point has already been dealt with.

An idea prevalent is that lack of moisture is the cause of "dead in the shell," because of the drying of the shell membrane and parts of the shell sticking to the chickens, which conditions usually accompany a bad hatch. But this always occurs no matter what the cause, and no amount of moisture would make any difference.

Lower Costs Mean More Profit.

The farmer is engaged in a complex business, and his aim, like that of every other business man, is to make the difference between his cost of production and the price he receives for his wares, in one word, his profit, as large as he can. Profits can be increased by raising prices and by lowering costs. Price-fixing is practically beyond the farmer's power. In fact, it seems almost certain that in the case of many of his products the Australian farmer is likely to receive lower rather than higher prices. His only hope, then, of winning through the period of depression is by reducing his costs of production.

But here, again, he has only a limited scope, many of the costs of production lying wholly, and others to a considerable extent, outside his control. His problem is twofold. He must first ascertain which of his costs it lies within his power to influence, and, secondly, he must try to find out the extent and the method by which he can reduce these costs. "How can I reduce my costs?" is another way of asking the question, "How can I improve my efficiency in production?" So the problem resolves itself into a question of management. For even the smallest farmer, who employs no labour but his own and that of his family, is the manager of a business, and every time he has to decide how that labour is to be utilised he is confronted with a question of management. In fact, management enters into every detail of the working of a farm other than the merest routine. Increased efficiency of management, then, is the key to reduction of costs.—B. Y. Whitman, in the Tasmanian *Journal of Agriculture.*

"Scaly Leg" in Poultry.

J. K. HUTCHISON, B.V.Sc., Veterinary Research Officer.

"SCALY LEG," as its name indicates, is a disease of the feet and legs of fowls, characterised by the piling up of the scales of the unfeathered portions with the accumulation of scabs. It is by no means uncommon, especially where sanitary conditions are bad, and appears to be more frequent in heavy breeds of fowls than in the light breeds.

The condition is due to the activities of a small mite, *Cnemidocoptes mutans*, visible only under the microscope, and which burrows under the scales and into the skin of the toes and shank.

Symptoms of the Disease.

"Scaly leg" is seen in fowls, turkeys and cage birds, but apparently not in water-fowls, such as ducks and geese. The first appearance of the disease is a minute blister just under the scales of the toes or shanks. This later bursts and the clear straw-coloured serum it contains oozes out. This serum dries and, with the accumulation of the dried serum and the formation of inflammatory tissue, the scales are raised up and large scabs are formed. The material under and between the scales forms a greyish-white, semi-powdery crust, a good deal of which may be removed without difficulty As the disease progresses scales may be shed, and the legs, being appreciably increased in size, become very unsightly. Itching is present, but is more pronounced at night.

While many severely affected birds show lameness, this is not present in all cases, even where there is much scab formation. The birds may become weak, cease laying and death may even occur from the irritation, lameness and lack of rest. "Scaly leg" is seen in birds of all ages, both male and female.

Spread of the Disease.

The shedding of scales or the falling off of scabs results in the spread of the mites, which may thereupon affect other birds. Usually when chicks are hatched under a hen affected with "scaly leg," every chick contracts the disease. This is no doubt due to the constant exposure of the chicks to infection under the conditions most favourable for its spread.

The rate of spread of this disease in a pen seems to depend to a considerable extent upon the ground surface and in general it may be stated that on well cared for and sanitary farms it does not spread as rapidly as on those where the conditions are not what they should be. The parasites may live in scales and scabs that have been shed for as long as thirty days in warm weather.

Treatment.

Affected birds should be isolated and treated individually. The feet and shanks should be dipped in warm, soapy water and as much as possible of the scabs and scales removed with a nail brush. The shanks and feet should then be treated with a dressing of which several are equally efficient, provided the application is thorough.

Thus one may employ :—

(a) Phenol disinfectant, 2½ to 5 per cent. solution according to the preparation used (one to two tablespoonsful to one pint of water);

(b) Kerosene emulsion;

(c) Lime and sulphur mixture; or

(d) Kerosene and non-drying oil, equal parts.

The treatment should be repeated in seven days and again as required. Disinfectants and creosote (wood preserving oil) are commonly used in greater strengths than above, or even undiluted, but while they effect rapid cure, they are too severe on the fowls.

Prevention.

The first step in prevention should be the isolation and treatment of affected birds in order to minimise and, if possible, prevent spread of the disease. Houses should be well cleaned out and, if their construction allows, disinfected. It may be pointed out that such a procedure will at the same time be of considerable value in the control of other parasites, such as red mites and worms, and of microbic diseases.

Yards should be well cleaned up, litter removed and dusty patches dug out and filled with clean earth.

Though the mites are able to live on the ground for about thirty days it is not thought that they survive much longer, and therefore the removal of fowls from a run for say six to eight weeks should be of benefit.

Annual State Conference of the Agricultural Bureau.

The Tenth Annual State Conference of the Agricultural Bureau will be held at the Hawkesbury Agricultural College, Richmond, from the 26th to 29th July. Accommodation will be reserved at the College for one delegate from each Branch, from each Sub-district Council, and from each District Conference till 30th June, after which date any available accommodation will be allotted to other delegates nominated by affiliated branches. In addition, accommodation will be reserved for fifty ladies.

A charge of £1 for accommodation will be made for each delegate. Secretaries should forward nominations and accommodation fees as early as possible (closing date, 30th June) to the Convening Secretary (Mr. E. J. Power), Box 36A, G.P.O., Sydney.

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Agricultural Gazette of New South Wales.

Pit Silage on the Central North Coast.

THE TRENCH TYPE BECOMES POPULAR.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

WHILE, on the whole, nature has treated farmers on the central north coast most generously, at least seven out of the past eleven springs (the last three in succession) have been so unfavourable that farmers have reason to regard a dry spring as the rule rather than the exception. In view of the persistency of these dry spells in the late winter and spring months, progressive farmers have found it almost imperative to adopt some system of conserving the over-abundant growth of late summer and autumn fodder crops and pastures, which invariably goes to waste, for use during the leaner months of the year, and as a means of conserving fodder en-siling has many points to recommend it.

A Well-made Pit Silo (Trench Type).

This pit, with a capacity of 40 tons, was excavated on the property of Messrs. Slyney Bros., of Moorland.

Types of Silos.

While there are a few overhead tub silos scattered throughout this district, the cost of erection, equipment, etc., has always been regarded as prohibitive, especially to the small farm owner and to share and tenant farmers. Fortunately, during the past twelve months the outlay for this type of silo has been reduced considerably, with the result that during the summer and autumn months of 1931-32 quite a number of overhead silos have been erected, chiefly in the Manning River district.

Stack silage (using maize) has been tried on several occasions, but in almost every instance has been a failure, chiefly because of faulty erection of the stack, insufficient material, etc.

The objections to the pit type of silo have been many, but they have not always been based on experience. It counts for nothing merely to say that good pit silage cannot possibly be made underground on the coast because of the high annual rainfall and consequent damage by seepage when the practical experience of successful farmers has demonstrated otherwise. Pit silage has been made with pronounced success at Bandon Grove, where a trench type of pit silo was twice covered by floods within the space of eighteen months, and yet opened up quite good. This particular pit had been put down in a well-drained soil. Again, at Mondrook and on the Bulga Plateau, where upwards of 20 inches of rain fell on the pits within a month or two after filling, the silage opened up well, notwithstanding that both pits were in heavy soil.

So impressed have farmers been with the possibilities of the pit as demonstrated by the results obtained at the places mentioned that probably the biggest "silage drive" in the history of the State is taking place at the present time in the Manning River district, and to a lesser degree on the Nambucca and Hastings Rivers. In the autumn of 1931 there were only about 100 tons of pit silage stored in the first-mentioned district, but to-day the quantity must be well over 2,000 tons, which, together with silage contained in eight or nine recently-erected overhead silos, is a remarkable achievement, and one which will mark 1932 the beginning of a silage era—at any rate in those districts mentioned.

Whilst it is not suggested that the pit is comparable with the overhead reinforced concrete silo, which is everlasting, it is regarded as a distinct possibility that once a farmer uses silage and realises its value it is only a matter of time before he endeavours to equip his farm with the more lasting overhead silo. This has already been the case on some of the farms in this district where pit silage was made for the first time last year.

Other Types of Pit Silos.

On the Comboyne Plateau several tub, or cylindrical shaped, pits have been made underground; simply dug out of the earth, in situations quite free of seepage, and placed under cover. They range from 16 to 18 feet deep and 12 to 14 feet in diameter at the top and slightly less at the bottom. This type of pit takes longer to dig than the trench, all the soil below 5 or 6 feet having to be lifted to the surface by some means. The silage is chaffed finely into this class of pit, whereas in the trench type of pit it is put in whole. What the cylindrical pits lack in depth as compared with the overhead tub silo is counterbalanced by the easiness with which the material is weighted down. The silage is quite good.

Another type of underground silo is that which is cut into the side of a hill, generally called the hillside silo. The chaffed material is placed in from the top side, the front being boarded up and the whole finally covered with earth.

Thus it will be seen that the types of underground silos vary considerably, the trench being the most popular.

Cost of Excavating the Trench Type of Pit.

There is no cheaper or quicker method of ensiling fodder than by "pitting" it. In excavating a pit of the trench type, the plough, scoop and mattock are practically the only implements required. The following are accurate figures in regard to the excavation of three typical pit silos during the past year.

At Lansdowne on a gravelly ridge two men, using a strong plough and scoop and four bullocks, excavated a trench type of pit silo to hold about 35 tons of maize silage in twenty-four working hours (extending over five days). At Moorland, on volcanic soil with a very heavy subsoil, two young men using a plough, scoop and two horses completed a very neat trench silo of 35 tons capacity in thirty working hours (extending over six days). At Wingham Brush, on a loamy soil, one young farmer using a one-horse plough and scoop excavated a trench of 35-ton capacity in twenty hours. In each instance the farmers regarded the cost as practically nil, the work being done in slack times between milkings and in a season when there was very little else to do.

Filling a Pit Silo on Mr. J. McLauchlin's Farm at Upper Lansdowne.

There have been instances where the time taken to excavate the pit has been prolonged. One farmer was unfortunate in striking a narrow seam of rocky material running diagonally across the pit 3 feet 6 inches under the surface. On the other hand, some farmers are using tractors, etc., to speed up the excavating work, but, of course, in such cases the cost of fuel and other incidentals must be taken into account.

When excavating, the surface soil, which is better than the subsoil for sealing the pit when filled, should be put on one side. The subsoil can be dumped where most convenient.

Size of the Pit (Trench Type).

A pit silo (trench type) to hold 35 tons will need to have the following dimensions:—Length, 50 feet at top and 20 feet at bottom; depth, 5 to 6 feet; width, 9 feet at top and 8 feet at bottom. It is important to have the walls smooth and gently sloping so as to ensure a constant downward pressure on the walls, thus excluding air. The sloping ends, or batters, are necessary to enable the loads to be drawn right into the pit during filling and also when the silage is being taken out.

It is not recommended that less than 25 tons or more than 70 tons should be ensiled in one pit. The smaller the quantity of material ensiled the greater will be the percentage of spoilt silage, while if the silo is too large it cannot be sealed satisfactorily when once opened, in the event of all the silage not being required for use at the one time. Two trenches of 35 tons capacity are better than one of 70 tons. Two such pits would hold sufficient silage to feed thirty-five cows for over three and a half months, allowing 40 lb. for each cow per day—quite a large herd for late winter, and a fairly long droughty period.

In the pits that have already been opened in this district, loss, due to spoilage, has in no case exceeded 10 per cent., and with a little extra care in the filling, and provided normal conditions are experienced, it should be possible to reduce this loss considerably. At Bandon Grove the loss was estimated at only 2 per cent., at Bulga Plateau practically nil, and at Mondrook, owing to rain getting in at the latter stages of emptying (there was no covering to exclude rain), about 10 per cent.

Selection of the Site.

If a knoll or the top of a ridge or spur be selected (such a position is to be found on nearly every farm) seepage will not be encountered, while the steep fall away on one or more sides allows of surface and underground water being easily drained away. By all means avoid heads of gullies and other depressions. Provided the soil is well drained, there need be no fear when excavating a pit on river flat country. One pit silo of the trench type opened on the Manning highlands during last autumn was in soil of such a peculiar clayey nature that when exposed, cracks both wide and deep immediately appeared in the walls and bottom. Possibly the loss of material in this type of soil will be considerable, and consequently a knowledge of the soils and subsoils of the farm is very necessary before deciding upon a site for the pit. It is also a big advantage if the silo can be located convenient to the feed stalls.

Stage at which to Cut Crops for Silage.

Maize makes the best silage. It is bulky, produces a heavy tonnage per acre, and retains its moisture well. It is at its best stage for cutting when

the grains cut like cheese, which is approximately three weeks later than the roaster stage. At any rate avoid the milky and over-ripe stages.

It sometimes happens that farmers' crops are of different ages—one patch ready for silage and the other immature. It is preferable to allow the latter to mature nearly to the correct stage, provided, of course, the earlier crop does not lose too much of its succulence. The ripest maize should be pitted first. Good maize silage should have a fairly high percentage of cobs scattered through it.

Lucerne is not recommended unless stalky and semi-mature, and then only as layers between maize. Legumes as a rule, owing to their soft, succulent growth, make an unsatisfactory mushy silage. Green succulent pasture can be used in layers between the maize. Sorghum well out in head also makes good silage alternated with layers of maize.

An End View of a Covered Pit.

Showing the height of the crown covering. This 35-ton pit is on the farm of Mr. Spencer Smith, of Wingham.

The short-handled hoe (18 inches) seems to be most commonly used for cutting maize in the field. By laying the stalks, which are heaped into bundles, all one way on the vehicle used for conveying to the silo, the crop can be handled more conveniently.

Filling the Pit Silo (Trench Type).

A start is made at one end of the floor of the trench by laying the bundles with the heads or tassels on the batter. The second row is placed with the heads overlapping to the cobs in the first row. Continue thus along the floor, when the last row will have the butt ends on the batter at the other end. It will be noted that the stalks are all placed lengthwise along the trench; under no circumstances place them crosswise. The second layer is

commenced at the opposite end to the first, facing the heads the opposite way and overlapping as in the first layer. This procedure is followed until the surface level is reached. It is necessary to pack the bundles in as closely as possible, especially along the walls, and to keep the middle a little higher than the sides. If a dray is used it should be driven through the silo during the filling; in the absence of a dray the roller may be used, for the quicker the material is firmed the quicker will the fermentation take place and the trench be filled. Motor vehicles cannot, of course, be driven through the silo, and slides push the material out of place.

After filling to the surface level it will be noticed that sinking takes place rapidly. It is now necessary to continue filling above the surface, adding a couple of layers every second day, using the roller to compress it. After about a week the downward movement becomes much more gradual, and when the level remains apparently stationary lay on more material until it is at least 2 feet above the ground surface, keeping it highest in the middle. Cover with a thin coat of grass if available and again roll. The earth (top soil) can now be scooped on, and should extend at least 2 feet beyond the sides and ends of the silo, and should be at least 12 to 18 inches deep and banked in the middle. The earth covering can be rolled, and, if available, some seed such as wheat, oats or rye sown thickly to bind the surface and prevent washing of the soil. Surface drains should then be made at each side to prevent rainwater running towards the trench. Should at any time a depression be noticed in the surface covering, more earth should be added.

Provided the site for the pit has been intelligently selected and the silo carefully filled and the material adequately consolidated, the silage should remain good almost indefinitely.

Filling the Cylindrical Pit.

In filling a cylindrical underground silo the material must first be chaffed finely. Care must be taken to tramp and press firmly round the edges, all operations being very similar to those adopted when filling the overhead silo. When filling ceases and the material appears fairly stationary, earth is filled in to exclude air and to compress the silage—about 2 feet of earth should be ample. Press it down firmly.

Should the material to be ensiled be on the dry or mature side, water can with safety be added. In the trench type of pit a gallon to the square foot when the pit is half full and the same when "topping off" will improve the silage and help to control the temperature, which invariably rises above normal when the material is dry.

Cost of suitable power machinery has been one of the drawbacks to farmers contemplating silage making. This difficulty has certainly been overcome by at least two Manning River farmers, who bought two worn-out motor-cars (of a well-known make), and by altering and adding various

parts they are now able to drive their chaff-cutters—one also supplies power for a sawbench—while there is also ample power to drive an elevator if necessary. Very little fuel is required. The total outlay in each instance was under £10. It is advisable to secure a make of car for which spare parts are available. Quite a number can be secured, and the idea is sure to become popular.

Preventing Damage by Rain.

While earth is sufficient covering after the pit is filled, some other form of protection is often necessary during filling operations. During the autumn months, especially on our coastal areas, heavy continuous rain might cause much inconvenience to silage makers. Light rain and falls of up to 2 inches are beneficial if allowed to fall on the maize in the trench. As a precaution against heavier falls, however, some sort of covering is

Protection Against Excessive Rain.

This illustration shows the position of the poles, on which galvanised iron can be placed should excessive rain fall during filling.

recommended. There are usually some sheets of bark or old iron, or even a tarpaulin or two, available on every farm. Several farmers have built skeleton frames (in three sections for convenience) with iron coverings, and these are simply lifted on to the trench when required. These coverings are also handy should heavy rain occur while the silo is being emptied. In one or two instances the need of a covering at this period has been obviated by making, at time of constructing the pit, a long, narrow, underground rubble drain from the lower end of the floor of the trench to lower down the slope. Before filling the silo the drain is sealed at the point where it enters the pit, and if the silo is emptied from this end any water that gains access to the silo can be emptied by means of the drain.

Removing the Silage from the Pit.

If, as suggested earlier, provision for drainage has been made, the covering should be removed from that end first; probably 8 or 10 feet may at first be necessary to expose sufficient silage for a couple of days' use. It is not advisable to expose at any one time more than is required for two days' feeding. Remove the soil cleanly with a scoop and shovel.

The first few feet of silage at the top of the batter will not be of much value and should be discarded. The silage is cut out in benches, working across the face either with a squaring axe or other suitable implement. It is advisable to cut a bench or benches right out each day from top to bottom rather than have too much surface exposed. If the silage is not to be chaffed, cutting into lengths of from 3 to 6 inches will be short enough. Chaffing and feeding with lucerne hay, ground maize, bran or other concentrates in stalls, boxes or nosebags is strongly recommended. Should this method be adopted a bench (or benches) containing the right quantity is cut, the silage packed on a slide or other vehicle and taken to the chaff-cutter. Pit silage cuts into a splendid sample if chaffed.

Unlike the overhead tub silo, from which silage is removed by shovelling through doors down a chute, the material from the underground pit has to be lifted. Several simple home-made contrivances are to be seen in this district, a particularly useful one consisting of a hinged arm of stout timber extending from a post with wire rope over the centre of the pit and large buckets or boxes attached. A home-made windlass lowers and lifts the silage, and the arm, being moveable, is guided round to where the silage is to be deposited.

Underground pits can be re-filled from any level, provided the thin layer of fermented material on the surface of the silage in the pit is first removed.

Feeding of Pit Silage.

Lucerne hay is best fed with silage at the rate of 8 lb. silage and 1 lb. lucerne hay per day for each 100 lb. body weight of the cow. Concentrates, such as cracked or crushed maize, bran meals and cakes, may be added. The major portion of the ingredients to be added can be produced on the farm or purchased cheaply. The chief point to emphasise is that silage can form the bulk or basis of a ration, and that at a time when there is very little other bulky food available on the central coast, namely, towards the end of winter and during the spring months.

Uniformity in Dairy Supervision.

Reliable and simple descriptions of the construction of dairy premises (with plans) and of a standard of uniformity for the application of official requirements in regard to the provision of the Dairies Supervision Act are provided by the *Dairy Manual*, recently issued by and obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney, price 1s. 1d. posted. The *Manual* also contains the Act and its Regulations.

Varieties of Maize.

Recommendations for Different Districts.

L. S. HARRISON, Special Agricultural Instructor.

THE following varieties of maize are recommended by the Department of Agriculture for planting in the various maize-growing districts of New South Wales. Growers are reminded to make early arrangements for seed supplies, and if in doubt as to which variety to sow to communicate with the Department.

APPROXIMATE ORDER OF MATURITY OF VARIETIES RECOMMENDED.

Very Early.—Early Morn, Golden Glow.

Early.—Wellingrove, Duncan, Golden Superb, Kennedy, Iowa Silvermine, Auburn Vale, Funk's Yellow Dent, Iowa Goldmine, Large Goldmine, Funk's Ninety-day.

Midseason.—Boone County White, Hickory King, Leaming, Golden Nugget, Early Clarence, Golden Beauty, Murrumbidgee White, Manning Silvermine, Giant White.

Late.—Yellow Hogan, Fitzroy, Large Red Hogan, Ulmarra Whitecap, Pride of Hawkesbury.

VARIETIES RECOMMENDED FOR GRAIN.

Upper North Coast.

(*a*) *Tweed River.*

Early Crop.—Leaming, Iowa Silvermine.

Main Crop.—Fitzroy, Ulmarra Whitecap, Large Red Hogan (for early sowing only).

(*b*) *Lower Richmond River.*

Early Crop.—Hickory King (second-class soils only), Leaming.

Main Crop.—Golden Nugget (second-class soils only), Fitzroy.

(*c*) *Upper Richmond River.*

Early Crop.—Leaming.

Main Crop.—Fitzroy, Large Red Hogan, Ulmarra Whitecap.

(*d*) *Clarence River.*

Early Crop.—Leaming, Wellingrove.

Main Crop.—Fitzroy, Ulmarra Whitecap.

Second-class Soils.—Golden Nugget, Hickory King.

(*e*) *Bellinger River.*

Early Crop.—Leaming, Golden Superb, Iowa Silvermine.

Main Crop.—Fitzroy, Ulmarra Whitecap.

NORTH COAST TABLELAND.

Dorrigo and Comboyne Districts.

Main Crop.—Leaming, Golden Superb.

MIDDLE NORTH COAST.

(a) Nambucca River.

Early Crop.—Golden Superb, Leaming, Hickory King, Manning Silvermine.

Main Crop.—Fitzroy, Yellow Hogan.

(b) Lower Macleay River.

Early Crop.—Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Golden Beauty, Pride of Hawkesbury, Leaming.

(c) Upper Macleay River.

Early Crop.—Golden Superb, Funk's Yellow Dent.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Leaming, Golden Beauty, Hickory King, Giant White.

(d) Hastings River.

Early Crop.—Funk's Yellow Dent, Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Golden Beauty, Golden Nugget, Leaming, Hickory King, Manning Silvermine.

(e) Lower Manning River.

Early Crop.—Funk's Yellow Dent, Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Pride of Hawkesbury, Leaming, Golden Beauty, Manning Silvermine, Hickory King.

(f) Upper Manning River.

Early Crop.—Golden Superb, Funk's Yellow Dent.

Main Crop.—Fitzroy, Leaming, Golden Beauty, Manning Silvermine, Hickory King.

CENTRAL COAST.

(a) Dungog, Gloucester.

Early Crop.—Golden Superb.

Main Crop.—Fitzroy, Hickory King, Leaming, Manning Silvermine, Yellow Hogan.

(b) Lower Hunter River.

Early Crop.—Funk's Yellow Dent, Golden Glow.

Main Crop.—Large Red Hogan, Fitzroy, Leaming.

(c) Hawkesbury River.

Early Crop.—Golden Superb.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Leaming, Manning Silvermine.

(d) County Cumberland.

Early Crop.—Hickory King, Wellingrove.

Main Crop.—Fitzroy.

SOUTH COAST.

(a) Illawarra District.

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Boone County White.

(b) Shoalhaven River.

Early Crop.—Funk's Yellow Dent.

Main Crop.—Leaming, Funk's Yellow Dent, Fitzroy, Boone County White, Hickory King.

(c) Milton District.

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Fitzroy, Large Red Hogan, Leaming.

(d) Moruya River.

Early Crop.—Funk's Yellow Dent, Early Morn.

Main Crop.—Large Red Hogan, Fitzroy.

(e) Bega and Pambula Rivers.

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Golden Beauty, Yellow Hogan, Hickory King, Boone County White.

NORTHERN TABLELAND.

(a) Tenterfield District.

Hickory King, Funk's Yellow Dent, Golden Glow, Iowa Silvermine, Wellingrove (heavy soil).

(b) Glen Innes District.

Strong Soils.—Wellingrove, Iowa Goldmine.

Light Soils.—Wellingrove, Iowa Silvermine.

(c) Ben Lomond, Llangothlin, Guyra, and Black Mountain Districts.

Early Morn, Golden Glow.

(d) Armidale District.

Wellingrove, Large Goldmine, Golden Glow.

(e) Uralla District.

Wellingrove, Early Morn, Large Goldmine.

CENTRAL TABLELAND.

(a) Bathurst District.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine.

(b) Colder Districts.

Early Morn.

SOUTHERN TABLELAND.

Moss Vale District.

Golden Glow.

NORTH-WESTERN SLOPES.

(a) Inverell District.

Heavy Soils.—Funk's Yellow Dent, Kennedy, Auburn Vale, Funk's Ninety-day.

Light Soils.—Wellingrove, Iowa Silvermine.

Late Sowing.—Early Morn, Golden Glow.

(b) Tamworth and Upper Hunter Districts.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

CENTRAL-WESTERN SLOPES.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine, Kennedy.

Upland Soils.—Iowa Silvermine, Early Morn, Duncan.

SOUTH-WESTERN SLOPES.

(a) Tumut River.

Rich Alluvial Flats.—Main Crop (October sowing), Early Clarence, Murrumbidgee White; Early Crop (late sowing), Funk's Yellow Dent.

Second-class Alluvials.—Funk's Yellow Dent, Iowa Silvermine.

(b) Murrumbidgee River (Gundagai District).

Funk's Yellow Dent, Murrumbidgee White, Iowa Silvermine, Golden Glow.

MURRUMBIDGEE IRRIGATION AREAS.

Funk's Yellow Dent, Iowa Silvermine.

VARIETIES RECOMMENDED FOR GREEN FODDER.

COASTAL DISTRICTS.

Early Varieties.—Hickory King, Leaming.

Late Varieties.—Fitzroy, Pride of Hawkesbury, Ulmarra Whitecap.

TABLELAND DISTRICTS.

For Warmer Districts.—Fitzroy.

For Cooler Districts.—Hickory King, Leaming.

For Coldest Districts.—Wellingrove.

WESTERN SLOPES AND MURRUMBIDGEE IRRIGATION AREAS.

Fitzroy.

Varieties of Oats in New South Wales.

[Concluded from page 419.]

ALLAN R. CALLAGHAN, D.Phil., B.Sc. (Oxon.), B.Sc.Agr., Assistant Plant Breeder.

THIS concludes the series of articles describing the varieties of oats in New South Wales. While the series in the main featured the chief varieties grown in this State, in this and the previous instalment the lesser-known varieties are dealt with.

Other Varieties Grown in Australia.

Dun.

Dun is one of the oldest varieties cultivated in England. It is mentioned in the earliest records of oat growing there, but information as to its origin is entirely lacking. Under Australian conditions it is much too late to do well other than in the colder tableland districts. It is very prostrate in early growth with fine foliage and exceptionally good tillering ability. For these reasons it has a certain vogue as a grazing oat. It has a very large, spreading equilateral panicle. The grain is dun coloured and has a particularly thin husk (or hull). In fact, from tests recorded by English workers and from work recently carried out here, it seems that it has no rival in this regard, as it invariably yields a higher percentage of groats (kernel, or caryopsis) than any other oat. This accounts for its popularity on the market as a feed oat, and for the special demand for it by racehorse trainers.

Greyish-coloured grain samples have come to hand from growers under the name Dun. The samples are probably of Grey Winter, a variety identical in growth characters with the variety Dun. A variety grown under the name of Scotch Grey in Victoria is probably synonymous with Grey Winter, and therefore very closely related to the Dun oat.

One of the outstanding features of this type of oat is its extreme winter hardiness, which enables it to be grown in areas where severe frosts are experienced, without fear of winter killing.

Abundance.

This variety is often known simply as Garton, or Garton's Abundance. It was bred by the seed merchants, Messrs. Garton, of England, by crossing White August and White Swedish oats, and is one of the earliest oats produced by crossbreeding. It was first placed on the market in 1892. Under general Australian conditions it is far too late and rust-liable to yield well, but it is still grown to a limited extent in the cooler tableland districts of New South Wales. The chief supplies to our markets of this

oat come from Tasmania and New Zealand, where conditions are more amenable to its successful cultivation. Under suitable conditions it is very productive for grain. The prolific panicle of Abundance is illustrated in Fig. 38.

Early Burt.

This variety is known also as Burt's Early and Burt The original Burt oat was selected from a field of Red Rustproof oats in America as early as

Fig. 38.—Panicle of Abundance.

Fig. 39.—Panicle of Early Burt.

1878. It has proved extremely variable, and the type most commonly known as Burt is later maturing than Early Burt or Burt's Early. The latter strains are grown to some extent in South Australia, Western Australia,

and Victoria. A tendency to shatter accompanied by weak straw prevents it rivalling other early-maturing varieties in New South Wales. The panicle of Early Burt is illustrated in Fig. 39.

Early Kherson.

The original type from which this variety was selected bears the name of Kherson, a province in Southern Russia, whence it was introduced

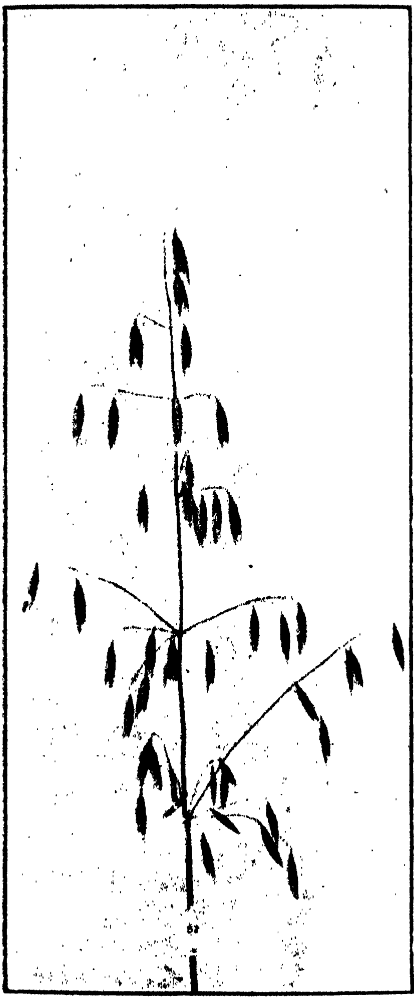


Fig. 40.—Panicle of Early Kherson.

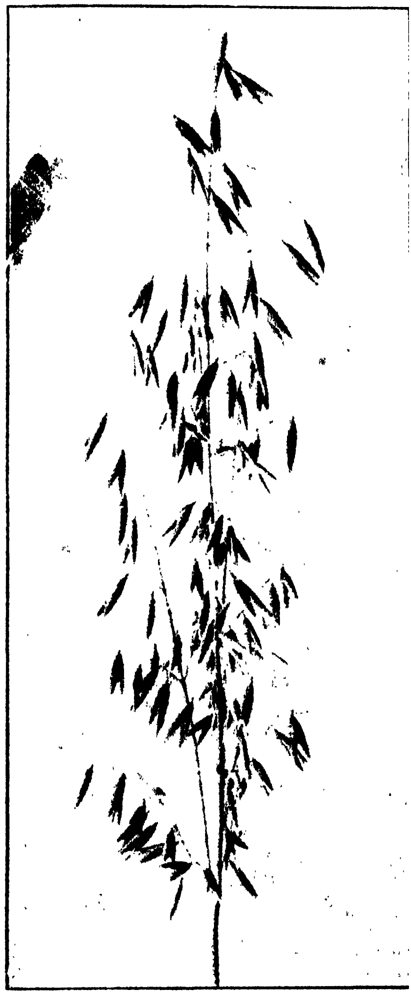


Fig. 41.—Panicle of Richland.

into America in 1896. Botanically it is very similar to the American variety Sixty-day. The strain most successfully cultivated in Australia is Early Kherson. It is an early maturing variety with rather small yellowish-white grain. Burke, an oat already described, is a selection from Early

Kherson, and in New South Wales it is superior to all other strains of the Kherson type. The outstanding feature of this oat and its selections is its high resistance to stem rust. The panicle of Early Kherson is illustrated in Fig. 40.

Ruakura.

Ruakura originated in New Zealand, where it was selected from a crop of Argentine oats. It is an early-maturing variety that had a certain popularity in New South Wales before the advent of more productive varieties. It is a good tillering variety, and under some conditions yields well, but it is not likely to compete successfully with varieties such as Belar or Mulga. It is sometimes referred to as Green's Ruakura, and has the reputation of being moderately resistant to crown rust.

Sir Douglas Haig.

Another variety raised by Garton, of England, is Sir Douglas Haig. It resulted from a cross between Supreme and a naked oat (*A. nuda*), and was first put on the market in 1920. It has a very large unilateral (one-sided) panicle, black grain, and very coarse straw. It is only suited to cold, long-seasoned districts, being grown successfully in New Zealand and Tasmania.

Calcutta.

This variety was introduced from Algeria. It is also grown under the names Brown Calcutta and Cape. Calcutta is of the Algerian class of oats, resembling Algerian in grain characters, but is earlier maturing. It has rather short, weak straw, and is very liable to lodge. Palestine is an oat of greater usefulness, though it is earlier. Calcutta matures about the same time as Belar. So many varieties are superior to it that it should not find a place among the cultivated varieties of the State.

Black Tartarian.

This is a very old English variety, sometimes known as Black Tartar. It has a unilateral (one-sided) panicle, and black grain. It is too late maturing for general cultivation in Australia, but it is grown to a limited extent in the colder districts and in Tasmania and New Zealand.

Potato.

Potato oats is one of the oldest distinct varieties of oats; it was discovered as a single plant in 1788 in a crop of potatoes in England. It was among the earliest oats introduced into Australia, but, like most English varieties, it is too late maturing and can only be grown with moderate success in cold tableland districts. More modern and better-yielding oats, however, are now available for such districts.

Quondong.

Quondong was raised in New South Wales as a selection from Ruakura. It gained temporary popularity as an early-maturing oat for drier districts, but has since been completely outrivalled by better-yielding varieties. It is still grown to some extent in Victoria.

Sparrowbill.

A variety so named because of the shape of its grain. It is a very late-maturing variety suitable only to cold climates. It has a large unilateral (one-sided) panicle and white, plump, short-pointed grain.

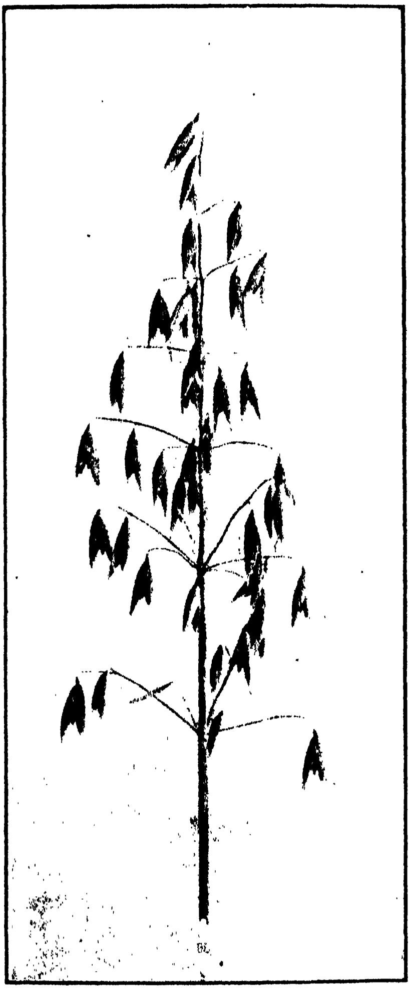


Fig. 42.—Panicle of Fergusson Navarro.

Fig. 43.—Panicle of Victoria.

Bathurst Early.

Bred in New South Wales by crossing Algerian and Carter's Cluster. Because of its earliness it was in favour in New South Wales until better yielding and more thrifty varieties replaced it.

Imbros Island.

A variety introduced from the Grecian Archipelago, very like Algerian in grain and general growth characters, but several days later maturing. It cannot compete successfully with Algerian.

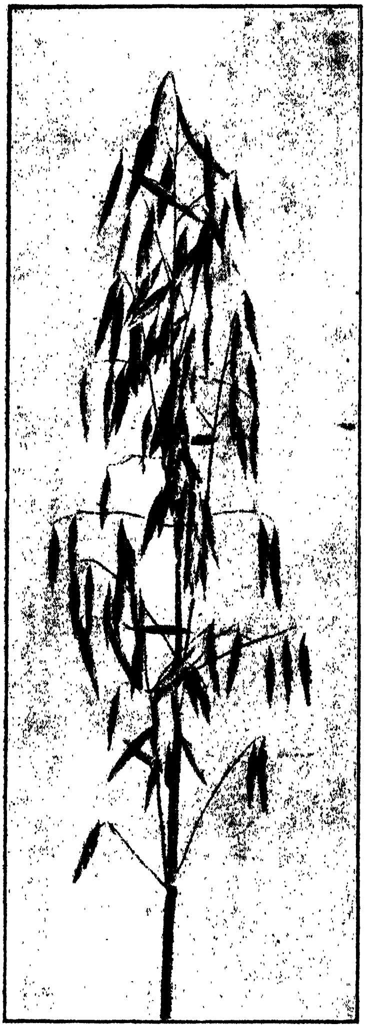


Fig. 44.—Panicle of Liberty (*A. nuda*).

Fig. 45.—Panicle of Liberty Selection (*A. nuda*). The panicle is larger and more prolific than that of Liberty.

College Algerian.

This is a late strain of Algerian and is also grown as New Zealand College Algerian. It is several days later than Algerian and consequently is better suited to climates such as prevail in Tasmania and New Zealand.

White Giant.

This is an English variety, but is sometimes spoken of as Tasmanian Giant. It is very late maturing and suitable only for colder climates. It is grown in Tasmania and finds a ready market as a plump feed oat.

Superb.

An English variety which is grown in Tasmania. It has short, white, plump grain with fairly thin husk. It is not suitable to other than cold climates.

Useful Varieties Introduced for Cross-breeding.

For several years the Plant Breeding Branch of the Department has been introducing oats from other countries on systematic lines, partly in the hope of obtaining varieties which might prove of direct agronomic worth, but chiefly to obtain disease-resistant sorts which might make useful parents in the programme of breeding for disease resistance. Varieties resistant to stem rust (*Puccinia graminis avenae*), crown rust (*P. coronata*), or oat smut (*Ustilago levis* and *U. avenae*), have been sought after all over the world, and some very useful parents have been obtained. It is thought that brief mention of the most outstanding of those so far introduced might be helpful to plant breeders elsewhere.

Richland.

Richland was introduced from U.S.A. and is a selection from Kherson made at Iowa in 1906. It is highly resistant to stem rust of oats, and has a prolific panicle (see Fig. 41), but very small grain. It has been used freely in cross-breeding work in New South Wales with promising results.

Iogold.

This variety is also a selection from Kherson, and was introduced from U.S.A. It is highly resistant to stem rust, and moderately resistant to crown rust.

Minnesota II-22-17.

This is a strain received from Minnesota, U.S.A., as II-22-17. It combines stem rust resistance with smut resistance and is regarded as a more suitable type for crossbreeding purposes than either Richland or Iogold. It is also moderately resistant to crown rust.

Fergusson Navarro.

This is a very distinctive oat which was received from U.S.A. in 1929. It is highly resistant to oat smut and produces plump well-filled grain. Dehulled samples of this oat have been highly commended by breakfast food manufacturers. Crosses with our varieties have yielded some particularly promising material. It has a small ovoidal panicle, as shown in Fig. 42. Besides having the attribute of smut resistance, Fergusson Navarro is a vigorous variety under Australian conditions. Good tillering and good recovery after cutting make it a useful parent in breeding better grazing oats.

Victoria.

This variety was received from U.S.A. and from the Argentine in 1931. It is much too late for our conditions, but has both oat smut and crown rust resistance. It has an attractive panicle (see Fig. 43), and should prove itself a useful parent in breeding for disease resistance.

Hajira.

This variety, received from U.S.A. in 1931, is reputed to be resistant to both stem and crown rust and to both oat smuts. It is being tested here in these regards and will probably be used in crossbreeding this year.

Liberty.

Liberty is a hull-less or naked oat and was received from Canada. It is illustrated in Fig. 44. There is a possibility of using this variety in the production of better-yielding types of hull-less oats. A high-yielding strain has been isolated from the variety (see Fig. 45), and crosses have been made.

(*Concluded.*)

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson...	2,000	2,000	700	1,000	500	6,200
Swane Bros....	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

—C. G. SAVAGE, Director of Fruit Culture.

Parsnip and Carrot Seed Production.

Local Seed Superior to the Imported Article.

JOHN DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

The last three issues of the *Agricultural Gazette* have featured articles on the production of seed of tomatoes, cucumbers and onions. This month's article deals with parsnip and carrot seeds, and it is hoped in subsequent issues to treat with the production of seeds of cabbages, cauliflowers, melons, pumpkins, squashes, etc. It is the policy of the Department to encourage the local production of our vegetable seed requirements, as apart from the fact that locally-produced seed has been proved to be superior to the imported article, the paying out of £75,000 annually for imported seed is a big drain on the industry.

Parsnips.

At the present time there are quite a number of successful vegetable growers in this State who make it a practice to grow their own requirements of parsnip seed. The low vitality of the imported seed forced these men to adopt this course. It is characteristic of parsnip seed that it quickly loses its vitality after it is two years old.

Parsnip in Flower.

Undoubtedly, parsnips are more successfully grown in the colder districts of the State than on the coastal areas, but growers producing their own seed requirements are to be found in all districts. However, it is to the cold portions of the State that we must look for the development of parsnip production on a commercial scale. Furthermore, as parsnips readily cross-pollinate, the production of seed cannot be carried out in such districts as Blayney, where wild parsnips have become a weed.

Cultural Methods.

The best time to sow parsnip seed is during August. Usually the seed is slow to germinate, with the result that difficulty is often experienced in obtaining a satisfactory stand. The rows are planted out 18 inches apart, and when the plants are well established they are thinned out to 4 inches apart in the rows.

In the colder districts the roots are ready for harvesting during March, and if allowed to remain in the soil generally run to seed heads during the spring months. The usual practice is to select ideal roots during digging, to be later transplanted for seed production. When the operations are on a much larger scale the best method is to plough a furrow away from the plants so as to expose the roots, and it is then an easy matter to go through the plants, remove any undesirable roots, and plough back the furrow against the selected ones, allowing them to run to seed in the spring.

Poor and Desirable Parsnip Types.
Left: Unselected roots. *Right:* Selected roots, suitable for seed production.

Good Seed Types.

The foregoing procedure is suitable for the bulk production of seed. It is essential, however, to keep the quality and standard of the strain up by individual selections.

The chief variety of parsnips grown in this country is Hollow Crown. The selected roots should have a broad crown, be thick through at the shoulders, and taper uniformly. The roots should be uniform in type, free from branching (forking) or numerous rootlets. The skin should be of a good even colour, free from blemishes, and present a smooth surface.

Harvesting of the Seed.

The seed of the parsnip grows in umbels, or flower clusters, which mature at various periods. Growers usually only select the largest central umbel for their own use, as it is found that the lateral seed clusters, which mature later, usually fail to fill properly. Some growers go through the crop with a knife and cut off all the lateral stems from the seed heads; this has a slight advantage, but is not justified when producing seed on a commercial scale. In commercial practice the best portions of the seed crop are harvested and threshed, care being taken not to smash the seed stalks, as these would be difficult to separate from the sample. The seed is cleaned by a blowing process. Heavy yields of parsnip seed are the rule rather than the exception.

Carrots.

The growing of carrot seed is carried out in much the same manner as that of parsnips. There are several varieties in cultivation in New South Wales, the most popular of which are Intermediate, Manchester Table, and Chantenay. All these varieties are liable to cross-pollination, and therefore only one sort should be grown if it is intended to produce seed. Moreover, in certain parts of the State there is a wild carrot, which will readily cross-pollinate with cultivated types, rapidly causing their deterioration, and consequently to attempt carrot seed production in such districts would be to court disaster.

Carrots Suitable for Seed Production.

In carrot seed raising it is the usual practice to transplant the roots, and the ideal type only of whatever variety is being grown should be saved for seed production. One of the chief considerations is to see that the roots are uniform in varietal characteristics. Avoid branching roots and those with an uneven surface. The ideal carrot should have a very small core.

The seed is borne in heads much more compactly formed than in the case of parsnips. Owing to the structure of these seed heads the seed is very difficult to clean without the proper machinery for the job. Home growers usually grasp the seed head and remove the seed by rubbing over a sieve. When this method is employed, however, it is a difficult matter to remove the seed stalks from the seed.

Intensive System of Grassland Management.

TWO YEARS' RESULTS AT BERRY EXPERIMENT FARM.

J. N. WHITTET, H.D.A., Agrostologist.

THE second year's results of the above trial are now presented, the previous history of all paddocks in the test, together with details of treatments, analyses of treated and untreated pasturage and first year's carrying capacity results, having been published in the June, 1931, issue of this *Gazette*.

The Second Year's Experience.

The greatest benefits from the work of renovation and top-dressing have been found in the paddocks where the paspalum was turned over with the plough four years ago, and seed of winter grasses and clovers then broadcasted and harrowed in on the upturned sod with the aim of providing a supply of succulent pasturage which would withstand cold conditions and produce palatable green feed when the pasture plant dominant in the sward, viz., paspalum (*Paspalum dilatatum*), was not exhibiting growth owing to being frosted. The seed mixture sown was perennial rye grass (*Lolium perenne*), 5 lb., cocksfoot (*Dactylis glomerata*), 2 lb., Perennial Red clover (*Trifolium pratense* var. *perenne*), 2 lb., and White clover (*T. repens*), 2 lb. per acre. Within three months of the completion of this work paspalum again dominated the sward.

The winter grasses have only shown to advantage in the paddocks sown, viz., 12A and 12B, since (1) the growth in these areas has been properly controlled; (2) suitable fertilisers have been applied; and (3) the sward has been worked and managed under the intensive system.

The paddocks 3A, 3B, and 3C are better class land than the 12A-14B section, the latter paddocks being considered second-class agricultural country; 11A and 11B can be classified as third-class land, the original covering being ti-tree scrub.

The manurial treatments per acre given during 1931 were as follows :—

Paddocks 3A and 13B	No manure.
" 3B, 11B, and 12B ...	2 cwt. superphosphate, autumn; 1 cwt. sulphate of ammonia, autumn and spring.
" 3C, 11A ...	2 cwt. superphosphate, autumn; 150 lb. nitro-chalk, autumn and spring.
Paddock 12A	2 cwt. superphosphate and 150 lb. nitro-chalk, autumn.
" 13A	2 cwt. superphosphate, autumn.
" 14A	2 cwt. superphosphate and 1 cwt. sulphate of ammonia, autumn.
" 14B	½ ton lime and 2 cwt. superphosphate, autumn.

Table I records the number of cow-grazing days per acre for each month of the second year of the test.

TABLE 1—NUMBER of Cow-days per Acre per Month.

Month.	Paddocks.										
	3A	3B	3C	11A	11B	12A	12B	13A	13B	14A	14B
1930.											
October (8th to 31st)	17·5	7·5	12·9	7·1	15·0	16·1	43·5	45·1	12·3	15·3	...
November	23·7	83·0	95·0	33·4	32·8	42·0	13·4	18·3	...	29·9	10·3
December	20·6	12·8	15·4	10·0	6·8	14·8	43·1	14·6	12·3	22·7	11·3
1931.											
January	48·0	58·9	37·2	39·3	26·3	52·0	...	41·0	...	29·3	...
February	16·3	26·1	14·9	24·7	45·6	39·0	29·7	27·9	52·0	34·3	7·4
March	15·7	23·5	22·3	7·0	14·7	57·1	13·4	17·6	5·9	...	...
April	15·7	30·8	33·6	11·7	14·2	46·7	75·9	30·1	27·1	34·9	...
May	31·7	18·4	22·5	...	13·4	6·1	15·4	32·9	11·6	...	...
June	14·6	22·0	25·1	13·2	11·0	...	18·9	...	...	...	...
July	19·1	21·5	43·0	8·6	15·4	28·9	...	12·3	...	...	...
August	8·2	18·7	6·1	19·9	4·6	10·6	15·9	15·9	...	16·9	...
September	12·7	19·0	16·4	17·2	14·6	10·9	32·3	10·9	...	...	14·1
October (1st to 7th)	...	...	...	7·8	...	..	11·1	...	4·9	9·6	...
Total	243·8	342·2	344·4	199·9	214·4	324·2	312·9	266·6	126·1	192·3	43·1

It will be seen from the above table that 13B (no manure) did not provide any grazing during the period June-September. The manager (Mr. Waller) reported on 8th March, 1931, that the cows would not graze satisfactorily at this time in 13B and had to be changed to a treated paddock next day; from June to August, inclusive, there was a splendid growth of soft grasses on most of the treated areas, but practically no growth was evident in the paspalum or in the untreated paddocks.

Costs of Fertiliser and Mechanical Treatment of Paddocks.

In arriving at the following costs of fertilisers, the prices of these materials have been taken over the periods 1929–30 and 1930–31 and averaged :—

Superphosphate, £4 12s. 6d. per ton; freight, Port Kembla to Berry, 4s.; cartage to farm, 2s.; total, £4 18s. 6d. per ton. Superphosphate applied at the rate of 2 cwt. per acre per annum = 10s. per acre approx.

Lime, 31s. per ton; freight, Portland to Berry, 8s. 5d.; cartage, 2s.; total, £2 1s. 5d. per ton. Lime is applied at ½ ton per acre once every three years; cost of lime per annum, 6s. 11d. per acre approx.

Sulphate of ammonia, £13 12s. 5d. per ton; freight, 4s.; cartage, 2s.; total, £13 18s. 5d. per ton. Sulphate of ammonia applied at the rate of 1 cwt. per acre per annum = 14s. per acre approx.

Paying award rates of 13s. per day, the per acre cost of applying fertiliser works out at 9d.; grass harrowing at 1s.; renovating with special paspalum cultivator at 3s. 6d.

The per acre treatment costs of a paddock, which, for example, received ⅓ ton of lime once every three years, 2 cwt. superphosphate, and 1 cwt. sulphate of ammonia each year, and also some mechanical treatment, would be somewhat as follows :—

	£	s.	d.
Lime, 6s. 11d. + 3d. (cost of application (9d.) spread over three years) ...	0	7	2
Sulphate of ammonia ...	0	14	0
Superphosphate ...	0	10	0
Cost of applying mixture of superphosphate and sulphate of ammonia ...	0	0	9
Grass harrowings—6 at 1s. each ...	0	6	0
One renovation with paspalum cultivator ...	0	3	6
Total ...	£2	1	5

Tables IIA and IIB give particulars of the returns obtained from the various paddocks after deducting mechanical working and fertiliser costs. The gain or loss per acre over the no-manure area in each series is also shown—Paddocks 3A-3C comprise one and 11A-14B the other series.

The main reason for the marked response to fertiliser and the heavy carrying capacity obtained in 12A and 12B is, as previously pointed out, that these areas were ploughed and seed of winter grasses and clovers broadcasted and harrowed in on the ploughed paspalum sod. Similarly, the low yield of 14A (an unploughed paddock) compared with the control area can be attributed to the residual effect of the ploughing that 13B had in 1928; 13A was also ploughed in that year. In the series 11A–11B and 13A–14B no winter grass mixture was sown.

The excellent winter and spring production from 3A-3C is mainly due to the spontaneous growth of perennial rye grass, which occurs each year on this fairly good quality, alluvial land.

TABLE IIA.

Paddock No.	Cows Carried per Acre.			Cow-grazing Days per Acre.			
	1929–30.	1930–31.	Average.	1929-30.	1930-31.	Total.	Average.
3A (no manure).	·74	·67	·705	270·3	243·8	514·1	257·05
3B	·99	·94	·965	364·9	342·2	707·1	353·55
3C	·86	·94	·900	315·2	344·4	659·6	329·80
11A	·45	·55	·500	164·3	199·9	364·2	182·10
11B	·68	·59	·635	247·3	214·4	461·7	230·85
12A	·99	·89	·940	362·5	324·2	686·7	343·35
12B	·97	·86	·915	359·4	312·9	672·3	336·15
13A	·65	·73	·690	239·0	266·6	505·6	252·80
13B (no manure).	·46	·35	·405	169·5	126·1	295·6	147·80
14A	·41	·53	·470	151·2	192·3	343·5	171·75
14B	·24	·12	·180	88·6	43·1	131·7	65·85

TABLE IIB.

Paddock No.	Total Cow-grazing Days per Acre for the Two-year Period (1929–31).	Increase (or Decrease) over No Manure in Cow-grazing Days per Acre. 1929–30.	1930–31.	Total, 1929–31.	Average per Annum	*Total Yield per Acre for Two-year Period.	Cost for Two Years for Fertiliser and Working of Paddocks. Fertiliser.	Working.	Total.	Total Gain per Acre for Two-year Period over Cost of Fertiliser and Working of Paddock.	Gain (or Loss) per Acre over No Manure. Two-year Period.	Average per Annum.
						£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
‡3A	514·1	...	...	...	...	19 5 6	†1 11 2	10 0	2 1 2	17 4 4	...	...
3B	707·1	94·6	98·4	193·0	96·50	26 10 4	5 3 9	12 0	5 15 9	21 14 7	3 10 3	1 15 1
3C	659·6	44·9	100·6	145·5	72·75	24 14 8	5 2 6	12 0	5 14 6	19 0 2	1 15 10	0 17 11
11A	364·2	— 5·2	73·8	68·6	34·30	13 13 2	4 8 6	13 0	5 1 6	8 11 8	−1 19 0	−0 19 6
11B	461·7	77·8	88·3	166·1	83·05	17 6 2	5 1 8	12 0	5 13 8	11 12 6	1 1 10	0 10 11
12A	686·7	193·0	198·1	391·1	195·55	25 15 1	4 8 6	14 0	5 2 6	20 12 7	10 1 11	5 0 11
12B	672·3	189·9	186·8	376·7	188·35	25 4 4	4 9 6	13 0	5 2 6	20 1 10	9 11 2	4 15 7
13A	505·6	69·5	140·5	210·0	105·00	18 19 2	1 5 0	10 0	1 15 0	17 4 2	6 13 6	3 6 9
‡13B	295·6	...	...	...	...	11 1 8	...	11 0	0 11 0	10 10 8	...	...
14A	343·5	—18·3	66·2	47·9	23·45	12 17 8	2 18 0	10 0	3 3 0	9 14 8	−0 16 0	−0 8 0
14B	131·7	—80·9	—83·0	—163·9	—82·95	4 18 8	0 17 2	10 0	1 7 2	3 11 6	−6 19 2	−3 9 7

* This yield is calculated on cow-grazing days, and is based on an assumption of a farmer's herd averaging ¾ lb. butter-fat per day per cow with butter-fat at 1s. per lb.

† 3A received fertiliser in the winter of 1929 only; later it was decided not to top-dress this area again in order have a control in this section of the trial, as the soil in 3A–3C is of better quality than that of the remainder the paddocks in the test.

‡ No manure.

The Effects of Ploughing.

The value of mouldboard ploughing paspalum paddocks once every five or six years as an effective means of renovating sod-bound pastures, was demonstrated by the Department at many centres in North Coast and Central Coast districts some few years ago, and particularly by experiments commenced at Wollongbar Experiment Farm, Lismore, in 1924. At the latter centre the total amount of grass cut per acre from the ploughed section during the first year after ploughing showed an increased yield of 127 per cent. over the unploughed area; at the completion of the second year of the test the increase amounted to 70 per cent. In these experiments, the residual effect of the ploughing carried out two years previously was evidenced by the weights obtained from a cutting of paspalum taken in one of the heavy growth periods of the year, viz., February, which were as follows:—

Treatment.	Weight of Pasture cut. tons.	cwt.	qrs.	lb.
Unploughed, no manure	3	7	3	7
Ploughed, no manure	5	13	1	13
Ploughed, and 2 cwt. superphosphate applied each year	6	3	3	27

Practically no loss of grazing is experienced during the three months' period after ploughing if seed of a quick-growing variety of oats is sown and harrowed in on the ploughed paspalum sod. It is preferable, however, to sow a mixture of perennial winter grasses and clovers which make growth during the winter months, when paspalum is more or less dormant, particularly in localities where heavy frosts are experienced.

Where it is impossible to work an ordinary mouldboard plough owing to the land containing stumps and roots, a stump-jump mouldboard plough or stump-jump paspalum cultivator can be used to renovate the paddocks.

From the commencement of the Berry trial until the autumn of 1931, 14B was a no-manure paddock on which comparatively long feed was maintained; the area was kept in this state in order to demonstrate to dairy farmers the fallacy of allowing a rank growth of pasturage to persist in any paddock. Too frequently we see this condition of growth existing in coastal districts on high-priced land, and the yield obtained from 14B over this two-year period provides a most convincing object lesson of the disadvantages arising from uncontrolled growth of pasturage. Cows coming off other paddocks in the test invariably refused to graze in 14B. This paddock has now been converted into a lime and superphosphate treated area, where the growth is properly controlled.

The Results in Butter-fat.

Owing to the fact that the milking herd was insufficient in number to cope with the feed produced in the various paddocks, it was found necessary to use the followers at certain periods to feed-off growth that was suitable for cows in milk. The figures given for cow-grazing days are, therefore, a more exact indication of the result of the treatments given than those for butter-fat production. On the other hand the butter-fat yields are interesting, since the areas with comparatively high yields denote the paddocks in which the best feed was produced, as the milking cows were always grazed on the best swards of palatable and nutritious pasturage.

TABLE III.—BUTTER-FAT Production per Acre.

Paddock No.	8th October, 1929, to 7th October, 1930.	8th October, 1930, to 7th October, 1931.	Total for Two-year Period.	Average per Annum.
	lb.	lb.	lb.	lb.
3A	193·53	173·476	367·006	183·503
3B	219·48	255·984	475·464	237·732
3C	215·59	221·460	437·050	218·525
11A	116·22	103·495	219·715	109·857
11B	163·65	171·992	335·642	167·821
12A	218·75	220·602	439·352	219·676
12B	212·82	223·243	436·063	218·031
13A	92·50	132·780	225·280	112·640
13B	118·25	41·288	159·538	79·769
14A	112·58	88·298	200·878	100·439
14B	24·78	30·333	55·113	27·556

It will be seen from Table III that four paddocks averaged over 200 lb. of butter-fat per acre per annum over the two-year period. This is largely attributed to the fact that these paddocks contained during the late autumn and winter and early spring months a good sole of perennial rye grass (*Lolium perenne*), the vigorous growth and general thickening up of which was largely caused by the application of the nitrogenous fertiliser.

Rainfall.

The rainfall at Berry for the two-year period of the trial is given below.

RAINFALL at Berry.

	First Year (1929–30). inches.	Second Year (1930–31). inches.		First Year (1929–30). inches.	Second Year (1930–31). inches.
October (8th to 31st) ...	8·74	3·84	June	16·11	1·39
November	5·40	1·49	July	1·85	10·32
December	2·36	10·85	August	1·17	·15
January	2·12	1·53	September	·30	10·10
February	1·28	3·12	October (1st to 7th) ...	·15	1·40
March	6·07	5·67			
April	4·27	8·62	Total	54·25	61·84
May	4·43	3·36			

THE GRADING OF TOBACCO.

IN most districts this very important work, demanding a good sense of discrimination, is now in progress, and it should be noted what the buyer's requirements are.

After the leaf has been conditioned it should be graded according to colour and size. The following are the grades:—

Lemon	Yellow coloured leaf, free from all blemish.
Bright	Next best bright leaf.
Bright Mahogany...	Bright leaf, slightly mottled with light red colour.
Mahogany	Ripe, red coloured leaf.
Dark A	Best dark long leaf, uniform in colour.
Dark B	Grade lower than above.
No. 2 Bright ...	All light coloured trashy leaf.
No. 2 Dark... ...	All dark coloured trashy leaf.

The bunches, known as "hands," should contain about twelve to fifteen leaves, according to size, and should measure approximately 3½ inches in circumference, this measurement to be over-all where the tie leaf is applied. The length of the leaves in each "hand" should be the same, and the tie leaf should be the same colour as the leaves in the "hand."

Separate bales should be used for the short and long "hands," and it is essential that the different grades be put up in separate bales. In size, the bales should conform to the following measurements:—Length, 36 inches; width, 22 inches; and depth, 18 inches. Only new hessian should be used, and the bales should be securely sewn. The grade and serial number should be stencilled on each bale, and bales should weigh not more than 200 to 220 lb.

Care should be taken that the leaf is not too moist; the "hands" should be in such a condition that when the leaves are squeezed together they will separate themselves on being lightly shaken. The "hands" should not be too dry, as obviously breakage will then occur when pressure is applied. In baling keep the "hands" horizontal with the butts outwards, and fill up the centre to level up.

Damaged, trashy, and green leaves and tips must be sorted into separate grades and clearly branded. Frost-bitten leaf is quite useless for manufacturing purposes. On some farms growers have produced leaf on totally different types of soil; any leaf grown on light sandy soil (not alluvial) should be kept separate, and the bales marked for identification at the time of examination by the purchasers.—C. J. TREGENNA, Tobacco Expert.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Potatoes (Certified Seed)—	
Factor	... Manager, Potato Section, Rural Co-op. Society, Ltd., Batlow.
	Secretary, Potato Growers' Association, Millthorpe.
Early Manhattan	... Secretary, Potato Growers' Association, Millthorpe.
Tomatoes—	
Improved Sunnybrook Earliana ...	... Mr. Albert Sorby, Macquarie Fields.
Marglobe	... Mr. S. A. Spicer, "Billabong," Lewis Ponds.
Asparagus—	
Connover's Colossal	... H. Eastwood, Tascott, *via* Woy Woy.
Cucumbers—	
Early Fortuna ...	... Mr. W. Parry, Terrigal.
	Mr. E. Money, Terrigal.
Grasses—	
Perennial Rye Grass	... Mr. C. Watson, Pyree, *via* Nowra.
Sudan Grass ...	... Messrs. F. and H. Owen, "Applegrove," Duri.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

SOW ONIONS IN BATHURST DISTRICT IN MARCH OR APRIL.

EXPERIMENTS to determine the best time to sow early and main crop onions on the granitic loams of the Bathurst district have been carried out during each of the last four years. Last season the best quality onions were obtained from March and April sowings, and, generally speaking, this was in keeping with results obtained in previous years. January, May, or June sowings are unprofitable. A very high percentage of seed-heads is always noticeable in plots of Hunter River Brown Spanish onions sown earlier than March.

Wheat Milling Tests.

Awards and Comments on R.A.S. Show Wheats, 1932.

G. W. NORRIS, Assistant Analyst, Chemist's Branch.

Keen interest on the part of wheat growers is shown each year in the results of the wheat milling and flour tests held in conjunction with the Royal Agricultural Society's Sydney Show. Although the tendency to-day under our f.a.q. system is for growers to be influenced in their choice of varieties mainly by high-yielding capacity, these tests are invaluable in indicating the relative commercial values of varieties, and will, of course, be of greater usefulness when a proper wheat-grading system replaces our present method.

Besides a championship prize for the best white wheat (other than strong or medium-strong) and a Commonwealth championship prize for the best medium-strong white wheat, a number of other prizes are awarded. A special class was included this year for growers who intend competing in the World's Grain Exhibition, to be held at Regina, Canada, in 1933. This latter innovation contributed in no small way towards making this year's contest a record one, no less than 233 samples being entered in the various classes.

Pusa No. 4 Outstanding.

SPEAKING generally, the quality of the wheats exhibited this year was better than last, which year, it will be remembered, was unfavourable to the production of strong wheats on account of rain at harvest time.

The most outstanding wheat this year was a sample of Pusa No. 4, exhibited by Mr. C. S. Huxley, of Warwick, Queensland. This sample scored 95 points; it is a translucent wheat of very good appearance, yielding over 75 per cent. flour, which is exceptionally high. The flour has an absorption of 67·5 per cent., and is rich in gluten (16 per cent.). Another feature worthy of comment was the high average bushel weight of some samples. Six entries of Petatz Surprise, from various districts, averaged 68·4 lb. per bushel, while a sample of this variety entered by Mr. T. F. Upperton, of Quirindi, registered 69 lb., a record for these tests. The "Waratah Special" class also contained some remarkably heavy samples, eighteen entries averaging 66 lb. per bushel.

The method of judging was similar to that of previous years, the wheats in each class being submitted to a very critical preliminary inspection and the obviously inferior samples eliminated. The remaining samples are then milled and points awarded according to the scale shown in the following tables. In the preliminary examination referred to, the samples are judged on appearance as to trueness to type, uniformity, and freedom from foreign matter. A maximum of ten points is awarded for appearance, and the experience of past years proves that when a wheat loses two points for appearance it invariably loses two more for bushel weight. As a loss of four points is too great a handicap for a wheat to win a prize, it would serve no purpose to mill such samples. A glance at the milling table shows the small margin of points between the prize winners in each section, and also demonstrates the fact that the prizes usually go to the wheats receiving full points for appearance.

RESULTS of Milling and Flour Testing.

Cat. No.	Variety.	Appearance Points.	Weight per Bushel. Actual Weight.	Weight per Bushel. Points.	Ease of Milling.	Percentage of Mill Products. Flour.	Percentage of Mill Products. Pollard.	Percentage of Mill Products. Bran.	Percentage of Mill Products. Flour Points.	Colour of Flour.	Dry Gluten. Per cent.	Dry Gluten. Points.	Strength. Water Absorption.	Strength. Points.	Total Points.
	Maximum Points ...	10	—	15	10	—	—	—	10	15	—	20	—	20	100
	Class 1200 (New South Wales Champion Prize).														
8532	Petatz Surprise	10	68	15	10	73·0	13·9	13·1	8	14	11·55	15½	41	6	78½
8533	Waratah ...	10	67½	14	10	74·6	13·6	11·8	9½	12	10·45	14½	41	6	76
8534	„ ...	9	66	13	10	73·4	14·4	12·2	8½	10	8·63	12½	41	6	69
	Class 1201 (Commonwealth Champion Prize).														
8538	Ford	8	66	13	10	74·8	13·3	11·9	10	11	10·0	14	42·6	7½	73½
8545	Clarendon ...	10	67	14	10	74·4	11·1	14·5	9½	15	10·0	14	43·0	8	80½
8547	Union... ...	9	66½	13	10	75·3	14·6	10·1	10	11	10·4	14½	44·4	9½	77
8548	Florence ...	9	66¾	13½	10	75·0	13·5	11·5	10	10	13·0	17	43·0	8	77½
8549	„ ...	9	66½	13	10	75·2	13·1	11·7	10	11	11·7	15½	45·0	10	78½
8552	Nabawa ...	9	64¾	11½	10	73·0	15·0	12·0	8	10	10·2	14	43·0	8	70½
8553	Gresley ...	8	66½	13	10	74·8	13·6	11·6	10	13	11·7	15½	42·8	8	77½
8557	Riverina ...	8	64½	11½	10	74·8	13·1	12·1	10	10	8·46	12½	45·6	10½	72½
8558	Ford	10	66¾	13½	10	74·8	13·1	11·1	10	9	11·7	15½	42·8	8	76
8559	Nabawa ...	9	65	12	10	73·2	14·0	12·8	8	9	7·4	11½	42·0	7	66½
8561	Clarendon ...	9	66	13	10	73·5	13·5	13·0	8½	15	10·5	14½	42·8	8	78
8562	Nabawa ...	9	66	13	10	74·0	14·0	12·0	9	10	7·7	11½	42·8	8	70½
8563	„ ...	10	63¾	10½	10	73·8	12·1	14·1	9	14	9·8	14	44·0	9	76½
8564	„ ...	9	65¾	12½	10	73·7	12·6	13·7	8½	11	12·2	16	43·0	8	75
8565	Ford	9	66½	13½	10	75·0	13·0	12·0	10	11	10·7	14½	42·0	7	75
8568	„	9	67½	14	10	75·0	13·0	12·0	10	10	9·2	13	42·8	8	74
	Class 1202 (Strong White).														
8572	Pusa No. 4 ...	10	67	14	8	74·5	14·0	11·5	9½	10	15·0	19	54·0	19	89½
8573	„ ...	10	67	14	8	74·0	12·2	13·8	9	15	10·5	14½	53·4	18½	89
8576	Comeback ...	10	67½	14	9	75·8	12·6	11·6	10	13	10·8	15	51·4	16½	87½
8577	Pusa No. 4 ...	10	67	14	8	75·3	12·7	12·0	10	11	11·0	15	53·4	18½	86½
8578	Comeback ...	9	67½	14	9	75·0	12·3	12·7	10	12	14·0	18	51·0	16	88
8579	Pusa No. 4 ...	10	68	15	8	75·5	11·9	12·6	10	13	15·8	20	54·0	19	95
8582	Quality ...	10	67¾	14½	9	75·5	12·7	11·8	10	10	12·1	16	48·0	13	82½
8583	Gullen ...	9	67½	14	9	74·0	14·0	12·0	9	15	9·6	13½	50·0	15	84½
	Class 1203 (Medium Strong—Regina Exhibition Special).														
8588	Ford	8	66	13	10	74·8	13·3	11·9	10	11	10·0	14	42·6	7½	73½
8592	Clarendon ...	10	67	14	10	74·4	11·1	14·5	9½	15	10·0	14	43·0	8	80½
8594	Florence ...	9	66¾	13½	10	75·0	13·5	11·5	10	10	13·0	17	43·0	8	77½
8595	„ ...	9	66½	13	10	75·2	13·1	11·7	10	11	11·7	15½	45·0	10	78½
8596	Gresley ...	9	66½	13	10	74·8	12·6	11·6	10	13	11·7	15½	42·8	8	78½
8597	Union... ...	9	67½	14	10	73·5	15·5	11·0	8½	15	10·5	14½	45·0	10	81
8600	Clarendon ...	9	66	13	10	73·5	13·5	13·0	8½	15	10·5	14½	42·8	8	78
8601	Nabawa ...	9	66	13	10	74·0	14·0	12·0	9	10	7·7	11½	42·8	8	70½
8602	„ ...	9	64½	11½	10	74·5	14·5	11·0	9½	13	9·5	13½	44·6	9½	76
8605	Ford	9	67½	14	10	75·0	13·0	12·0	10	10	9·2	13	42·8	8	74
	Class 1204 (Strong White—Regina Exhibition Special).														
8609	Pusa No. 4 ...	10	67	14	8	74·5	14·0	11·5	9½	10	15·0	19	54·0	19	89½
8610	„ ...	10	67	14	8	74·0	12·2	13·8	9	15	10·5	14½	53·4	18½	89
8614	Comeback ...	10	67½	14	9	75·8	12·6	11·6	10	13	10·8	15	51·4	16½	87½
8615	Pusa No. 4 ...	10	67	14	8	75·3	12·7	12·0	10	11	11·0	15	53·4	18½	86½
8616	Comeback ...	9	67½	14	9	75·0	12·3	12·7	10	12	14·0	18	51·0	16	88
8619	Quality ...	10	67¾	14½	9	75·0	12·7	11·8	10	10	12·1	16	48·0	13	82½
8620	Gullen ...	9	67½	14	9	74·0	14·0	12·0	9	15	9·6	13½	50·0	15	84½
8624	„ ...	9	67½	14	9	74·6	13·2	12·2	9½	14	9·7	13½	48·8	14	88
	Class 1205 (Special) [Waratah].														
8626	Waratah ...	10	66¾	13½	10	74·3	13·2	12·5	9	15	9·62	13½	41·8	7	78
8627	„ ...	9	66	13	10	74·5	13·5	12·0	9½	13	10·98	15	41·4	6½	76
8630	„ ...	10	67½	14	10	74·6	13·6	11·8	9½	12	10·45	14½	41·0	6	76
8631	„ ...	9	66	13	10	73·4	14·4	12·2	8½	10	8·63	12½	41·0	6	69
8634	„ ...	9	66	13	10	74·7	13·7	11·6	9½	14	10·89	15	41·6	6½	77
8641	„ ...	10	66½	13½	10	74·5	14·0	11·5	9½	14	9·43	13½	41·8	7	77½

Results of Milling and Flour Testing—*continued.*

	Variety.	Appearance Points.	Weight per Bushel. Actual Weight.	Weight per Bushel. Points.	Ease of Milling.	Percentage of Mill Products. Flour.	Percentage of Mill Products. Pollard.	Percentage of Mill Products. Bran.	Percentage of Mill Products. Flour Points.	Colour of Flour.	Dry Gluten. Per cent.	Dry Gluten. Points.	Strength. Water Absorption.	Strength. Points.	Total Points.
	Maximum Points ...	10	—	15	10	—	—	—	10	15	—	20	—	20	100
	Class 1206 (Special) [Nabawa].														
8652	Nabawa ...	9	64¼	11¼	10	73·0	15·0	12·0	8	10	10·2	14	43·0	8	70¼
8654	" ...	9	63	10	10	74·8	13·5	11·7	10	13	10·2	14	44·4	9½	75½
8655	" ...	9	65	12	10	73·2	14·0	12·8	8	9	7·46	11½	42·0	7	66½
8656	" ...	9	66	13	10	74·0	14·0	12·0	9	10	7·7	11½	42·8	8	70½
8657	" ...	10	63½	10½	10	73·8	12·1	14·1	9	14	9·8	14	44·0	9	76½
8658	" ...	9	65½	12½	10	73·7	12·6	13·7	8½	11	12·2	16	43·0	8	75
8659	" ...	9	66	13	10	74·6	15·0	10·4	9½	14	9·4	13½	44·5	9½	78½
8661	" ...	9	66	13	10	73·8	16·0	10·2	9	14	9·1	13	44·6	9½	77½
	Class 1207 (Novice Class—Medium-Strong or Weak Flour Wheat).														
8663	Petatz Surprise	9	67½	14½	10	74·0	13·8	12·2	9	14	10·9	15	43·0	8	79½
8666	" ...	10	68	15	10	73·0	13·9	13·1	8	14	11·55	15½	41·0	6	78½
8670	Union... ...	9	66¼	13	10	75·3	14·6	10·1	10	11	10·4	14½	44·4	9½	77
8671	Waratah ...	9	66	13	10	73·4	14·4	12·2	8½	10	8·63	12½	41·0	6	69
8673	Nabawa ...	9	64¼	11¼	10	73·0	15·0	12·0	8	10	10·2	14	43·0	8	70¼
8674	Riverina ...	8	64½	11½	10	74·8	12·1	12·1	10	10	8·46	12½	45·6	10½	72½
8675	Ford	10	66½	13½	10	74·8	13·1	11·1	10	9	11·7	15½	42·8	8	76
8676	Nabawa ...	9	65	12	10	73·2	14·0	12·8	8	9	7·46	11½	42·0	7	66½
8677	Aussie ...	8	67	14	10	73·8	13·1	13·1	9	15	9·3	13	43·5	8½	77½
8678	Nabawa ...	9	66	13	10	74·0	14·0	12·0	9	10	7·7	11½	42·8	8	70½
8679	" ...	9	64½	11½	10	74·5	14·5	11·0	9½	13	9·5	13½	44·6	9½	76
8680	Waratah ...	10	66½	13½	10	74·5	14·0	11·5	9½	14	9·43	13½	41·8	7	77½
8681	Nabawa ...	9	65½	12½	10	72·7	12·6	13·7	8½	11	12·2	16	43·0	8	75
8682	Ford	9	66½	13½	10	75·0	13·0	12·0	10	11	10·7	14½	42·0	7	75
8683	Florence ...	10	67	14	10	75·2	14·4	10·4	10	13	11·6	15½	47·6	12½	85
8684	Petatz Surprise	10	68½	15	10	73·6	14·1	12·3	8½	12	9·25	13	42·0	7	75½
8685	Ford	9	67¼	14	10	75·0	13·0	12·0	10	10	9·2	13	42·8	8	74
8687	Petatz Surprise	10	69	15	10	74·9	13·8	11·2	10	14	9·4	13½	42·0	7	79½
	Class 1208 (Hard Federation or Florence).														
8690	Florence ...	9	66½	13½	10	75·0	13·5	11·5	10	10	13·0	17	43·0	8	77½
8691	" ...	9	66¼	13	10	75·2	13·1	11·7	10	11	11·7	15½	45·0	10	78
8694	" ...	10	67	14	10	75·2	14·4	10·4	10	13	11·6	15½	47·6	12½	85¼
8696	" ...	9	67	14	10	75·1	14·4	10·5	10	15	11·1	15	47·4	12½	85½
	Class 1209 (Weak Flour Wheats).														
8698	Petatz Surprise	9	67½	14½	10	74·0	13·8	12·2	9	14	10·9	15	43·0	8	79½
8699	Waratah ...	9	66	13	10	74·2	14·2	11·6	9	15	8·96	13	43·0	8	77
8700	" ...	9	66	13	10	74·5	13·5	12·0	9½	13	10·98	15	41·4	6½	76
8702	Petatz Surprise	10	68	15	10	73·0	13·9	13·1	8	14	11·55	15½	41·0	6	78½
8703	" ...	10	68½	15	10	74·6	13·6	11·7	9½	12	11·7	15½	42·8	8	80½
8704	Waratah ...	10	67¼	14	10	74·6	13·6	11·8	9½	12	10·45	14½	41·0	6	76
8705	" ...	9	66	13	10	73·4	14·4	12·2	8½	10	8·63	12½	41·0	6	69
8706	" ...	9	66	13	10	74·7	13·7	11·6	9½	14	10·87	15	41·6	6½	77
8708	Nizam ...	10	66½	13½	10	72·8	14·1	13·1	8	15	9·35	13	41·0	6	75½
8711	Petatz Surprise	10	68½	15	10	73·6	14·1	12·3	8½	12	9·25	13	42·0	7	75½
8713	" ...	9	68½	15	10	74·8	12·6	12·6	10	11	7·44	11½	42·5	7½	74½
	Class 1210 (Medium Strong—Field Wheat Competitors).														
8717	Yandilla King	9	66¼	13	10	74·3	14·2	11·5	9	15	9·0	13	43·0	8	77
8733	Nabawa ...	10	64	11	10	74·1	14·9	11·0	9	13	10·0	14	43·6	8½	75½
8737	Ford	10	66½	13½	10	74·8	13·1	11·1	10	9	11·7	15½	42·8	8	76
8738	Nabawa ...	8	64½	11½	10	74·6	15·0	10·4	9½	13	9·8	14	44·6	9½	75½
8739	Clarendon ...	9	66	13	10	73·5	13·5	13·0	8½	15	10·5	14½	42·8	8	78
8742	Ford	9	67	14	10	74·7	13·7	11·6	9½	15	10·5	14½	42·2	8	80
8743	"	9	66½	13½	10	75·0	13·0	12·0	10	11	10·7	14½	42·0	7	75
8744	"	9	67¼	14	10	75·0	13·0	12·0	10	10	9·2	13	42·8	8	74
8745	"	9	67½	14½	10	74·5	14·9	10·6	9½	15	10·9	15	43·0	8	81
	Class 1211 (Weak Flour—Field Wheat Competitors).														
8752	Turvey ...	8	65	12	10	73·5	13·2	13·3	8½	13	10·8	15	41·0	6	72½
8755	Federation ...	9	64½	11½	10	73·5	13·3	13·2	8½	15	8·9	13	42·0	7	74
8757	Aussie ...	8	67	14	10	73·8	13·1	13·1	9	15	9·3	13	43·5	8½	77½
8764	Penny ...	9	64½	11½	10	74·0	13·0	13·0	9	14	10·5	14½	43·4	8½	76½

Awards.

Class 1200	First Prize, No. 8532.—W. H. Clarke; Petatz Surprise, grown at Barmedman on heavy clay; seed per acre, 45 lb.; yield per acre, 33 bushels; fallow. Second Prize, No. 8533.—J. M. Gollasch; Waratah, grown at Milbrulong on red loam; seed per acre, 75 lb.; yield per acre, 18 bushels; fallow.
Class 1201	First Prize, No. 8545.—J. W. Eade; Clarendon, grown at Euchareena on chocolate loam; seed per acre, 50 lb.; yield per acre, 24 bushels. Second Prize, No. 8549.—J. K. Hebition; Florence, grown at Three Springs, W.A., on chocolate loam; seed per acre, 60 lb.; yield per acre, 15 bus.
Class 1202	First Prize, No. 8579.—C. S. Huxley; Pusa No. 4, grown at Warwick, Queensland, on light loam; seed per acre, 60 lb.; yield per acre, 18 bushels. Second Prize, No. 8572.—J N. Barrett; Pusa No. 4, grown at Edgeroi on heavy chocolate loam; seed per acre, 30 lb.; yield per acre, 30 bushels; fallow.
Class 1203	First Prize, No. 8597.—D. and J. Mactier; Union, grown at Tatura, Victoria, on red loam; seed per acre, 80 lb.; yield per acre, 21 bushels; fallow. Second Prize, No. 8592.—J. W. Eade; Clarendon, grown at Euchareena on chocolate loam; seed per acre, 50 lb.; yield per acre, 36 bushels; fallow.
Class 1204	First Prize, No. 8609.—J. N. Barrett; Pusa No. 4, grown at Edgeroi on heavy chocolate loam; seed per acre, 30 lb.; yield per acre, 30 bushels. Second Prize, No. 8610.—W. H. Clarke; Pusa No. 4, grown at Barmedman on heavy clay; seed per acre, 40 lb.; yield per acre, 31 bushels.
Class 1205	First Prize, No. 8626.—G. G. Ballantyne; grown at Ariah Park on medium red loam; seed per acre, 60 lb.; yield per acre, 29 bushels; fallow. Second Prize, No. 8641.—G. C. Pfitzner; grown at Goolgowi on sandy loam; seed per acre, 50 lb.; yield per acre, 33 bushels.
Class 1206	First Prize, No. 8659.—F. C. Rowlands and Son; grown at Cowra on red, sandy loam; seed per acre, 65 lb.; yield per acre, 21 bushels. Second Prize, No. 8661.—T. F. Upperton; grown at Quirindi on black soil; seed per acre, 50 lb.; yield per acre, 40 bushels; fallow.
Class 1207	First Prize, No. 8683.—T. and D. Scott; Florence, grown at Currabubula on red soil; seed per acre, 45 lb.; yield per acre, 40 bushels. *Second Prize, No. 8687.—T. F. Upperton; Petatz Surprise, grown at Quirindi on red loam; seed per acre, 50 lb.; yield per acre, 30 bushels. *Second Prize, No. 8663.—G. G. Ballantyne; Petatz Surprise, grown at Ariah Park on rich red loam; seed per acre, 45 lb; yield per acre, 25 bushels; fallow.
Class 1208	First Prize, No. 8696.—T. F. Upperton; Florence, grown at Quirindi on red loam; seed per acre, 50 lb.; yield per acre, 27 bushels. Second Prize, No. 8694.—T. and D. Scott; Florence, grown at Currabubula on red soil; seed per acre, 45 lb.; yield per acre, 30 bushels.
Class 1209	First Prize, No. 8703.—J. M. Gollasch; Petatz Surprise, grown at Milbrulong on red loam; seed per acre, 70 lb.; yield per acre, 21 bushels; fallow. Second Prize, No. 8698.—G. G. Ballantyne; Petatz Surprise, grown at Ariah Park.
Class 1210	First Prize, No. 8745.—L. A. Schields; Ford, grown at Baan Baa on chocolate soil; seed per acre, 39 lb.; yield per acre, 30 bushels. Second Prize, No. 8742.—Pilditch Bros.; Ford, grown at Culgoora on dark chocolate loam; seed per acre, 40 lb.; yield per acre, 45 bushels.
Class 1211	First Prize, No. 8757.—J. Parslow; Aussie, grown at Balladoran on sandy loam; seed per acre, 60 lb.; yield per acre, 27 bushels; fallow. Second Prize, No. 8764.—J. H. Wareing; Penny, grown at Tullibigeal on red loam; seed per acre, 62 lb.; yield per acre, 39 bushels; fallow.

* Equal for 2nd Prize.

Acknowledgment.

Mr. C. H. Crago, of Messrs. F. Crago & Co., Ltd., Newtown, again represented the Flour Mill Owners' Association, and ably assisted in the judging of Class 1200. Thanks are also due to Mr. R. M. Petrie, Chemist's Branch, for assistance given in the weighing of the samples.

Fallowing Ensures Success.

POINTS BROUGHT OUT BY THE FALLOWING COMPETITIONS, 1931–32.

In recent years there has been a noticeable improvement in the standard of farming in practically every wheat-growing district of the State. In many instances the improvements have been forced on farmers by the bitter experience of crop failures, brought about largely by sowing on poorly-prepared seed beds. Others have escaped the hard school of experience by following out the methods indicated in the published reports of fallowing and such-like competitions.

It is admitted that cultural practices must necessarily differ in detail in different districts—even in different localities in the same district—but the principles demonstrated are capable of application under all conditions.

South-western District Methods.

IN this district Mr. D. V. Dunlop, Agricultural Instructor, judged fallowing competitions conducted by the Barellan, Ariah Park, Ungarie and Quandialla agricultural associations, and by the Tullibigeal and Yaddra branches of the Agricultural Bureau.

The general standard of the fallows was not up to that of previous years, except at Tullibigeal. Seasonal conditions were such as to render the production of high class fallows extremely difficult.

The importance of a working, with a springtooth cultivator for preference, as soon as possible after ploughing was strikingly illustrated in all competitions. Where is was neglected or delayed too long the seed-bed was cloddy and the surface rough. A marked difference in moisture content was also noted in favour of those fallows which had been worked once or twice before harvest. In some cases where this cultivation had been neglected, farmers had to roll or use disc implements in an endeavour to break down clods.

The increasing use of the scarifier instead of the plough, particularly for the first working, was also emphasised by these competitions. Where the work is satisfactorily performed by the scarifier its use is quite justified. It is also the best implement for late workings, putting the seed-bed in excellent order.

The Season.

The abnormally heavy rains during the months of May and June considerably delayed initial ploughings. Few paddocks were ploughed before August and many in September. The land in most cases was on the wet side and inclined to be "boggy" when ploughed, and dried out very rough and "lumpy." Conditions generally were dry during the spring and summer months and little effective work was done. Fortunately exceptionally good rains were experienced early in April, and it was not until then that the surface of many fallows could be made sufficiently fine for satisfactory sowing.

Weed growth was naturally very light and had been kept in check by sheep in most cases. Wild oats were unfortunately common at Quandialla and odd fallows at other centres carried melons.

Generally, the moisture content of the competition fallows was excellent, having been conserved from the winter rains.

TABLE showing Rainfall at Competitive Centres.

——	Barellan.	Ariah Park.	Ungarie.	Quandialla.	Tullibigeal.	Yaddra.
1931.	points.	points.	points.	points.	points.	points.
July	73	90	95	137	112	82
August	36	50	72	67	34	0
September ...	59	72	131	153	151	105
October	77	37	37	37	20	24
November ...	280	144	155	169	178	120
December ...	3	23	186	304	29	20
1932.						
January ...	0	3	9	0	0	0
February ...	29	104	70	58	30	75
March	138	167	137	228	146	131
Total ...	695	690	892	1,153	700	557

The Barellan Competition.

This competition was divided into two sections, viz., open country and mallee. The open section attracted fifteen entries and was won by Mr. G. Gow, whose land was a very heavy loam, with good moisture content and a good clean mulch. Mr. Gow ploughed in July, 1930, but did not sow last season on account of the wet conditions. The fallow was combined and cross-combined in September, 1931, and scarified in March and April.

Only three entries were received in the mallee section, which was won by Mr. J. W. Costolloe, who scarified his land in July, August, November, and March.

The Ariah Park Competition.

The Ariah Park competition attracted ten entries and was won by Mr. D. W. Edis. The land is a medium loam, and was ploughed in July, spring-toothed in September and October, and combined in January and March. The mulch was very nearly perfect and there was no trace of weed growth.

The Ungarie Competition.

This competition was divided into two sections—one for light soils and the other for heavy land. Ten entered in the light section and only one in the heavy section.

Mr. M. J. Vallance was awarded first place for a particularly fine entry, which was mouldboard ploughed in June, scarified in August, and combined in September and March. Of high moisture content it was very clean and had good compaction.

The Quandialla Competition.

Fourteen entries were judged in this competition and first place was won by Mr. A. L. Harnett. The land is of a heavy self-mulching character; it was scarified in August and October, sundercut in November and February, and scarified in March. The moisture content was exceptionally high, while the mulch, cleanliness and compaction were good.

The Tullibigeal Competition.

This competition attracted nineteen entries.

The winner was Mr. J. Blair, who exhibited a block of heavy country, which was mouldboard ploughed in August, springtoothed in October and January, and combined in March.

The Yaddra Competition.

This was the first competition conducted by this branch of the Bureau and it attracted ten entries. The fallow exhibited by the winner, Mr. W. J. Norris, was outstanding, its strong points being moisture content, compactness and cleanliness. The land was scarified in July, combined in October, and scarified in March.

Fallowing in the North-west.

The Gunnedah Pastoral and Agricultural Association was the only organisation in the north-western district to conduct a fallow competition last season.

Analysing the results of the competition the judge, Mr. J. A. O'Reilly, local agricultural instructor, points out that the entries comprised five winter fallows and five short summer fallows. Winter fallowing gives the soil an occasional spell, which has the effect of restoring soil fertility and controlling weed growth and fungous diseases.

The late autumn of 1931 was very wet in this district and rains continued into June. The spring proved dry, and not until November and December did further rains of any consequence occur. The monthly falls recorded at Gunnedah were:—June, 1931, 428 points; July, 79 points; August, 151 points; September, 53 points; October, 46 points; November, 223 points; December, 550 points; January, 1932, 34 points; February, 71 points; March, 261 points; April, 93 points; total, 1,989 points.

These rains were useful in consolidating early worked fallows and brought about ideal conditions for the preparation of a good deal of stubble land for this year's crop.

The Benefits of a Timely Working.

An interesting point is that the fallow which secured second in the competition was ploughed following these December rains, with the result that at time of judging it contained an excellent supply of moisture. Quite

a deal of land in the district could have been worked in this manner instead of being left till January and February, which months were hot and dry, while, in addition, the soils were not in a suitable condition to plough, necessitating much late working in March, with consequent dry and loose seed-beds.

On the average, the fallows in the Gunnedah competition were worked 3.8 times. The initial working was given with the rigid scarifier in three instances, with the disc plough in four cases, while two competitors used the springtooth cultivator and one the mouldboard plough. The use of the rigid tine scarifier is becoming more common in the north-western wheat areas, and as a consequence better fallows should result.

Western District Competitions.

Mr. H. Bartlett, Senior Agricultural Instructor, judged fallow competitions promoted by the Trundle P. and A. Association, and the Gunning Gap, Fillifogi and Denmore branches of the Agricultural Bureau.

The following rainfall registrations were made at Gunning Gap and can be taken as representative of the other districts in which competitions were held:—June, 1931, 257 points; July, 172 points; August, 38 points; September, 139 points; October, 42 points; November, 108 points; December, 243 points; January, 1932, nil; February, 59 points; March, 270 points; total, 13.28 inches.

As the average rainfall over this period is 16 inches, it might be concluded that the fallows were lacking in subsoil moisture, but such was not so, as some of the moisture from the heavy falls (totalling about 10 inches) in March, April and May of 1931 remained to supplement the somewhat deficient total received during the fallowing period.

Seasonal Conditions Restrict Area Fallowed.

The wet winter generally delayed ploughing until August and September, and the soil upon drying mostly proved too hard to work. These factors greatly restricted the area of fallowed land in this district. The substantial falls of early December were followed by a dry, hot spell until early March, but subsequently rains have proved most opportune for placing the seed-beds in the desired condition.

RESULTS of the Western District Fallowing Competitions.

District.	First.		Second.	
	Competitor.	Points.	Competitor.	Points.
Trundle	S. A. Bloomfield ...	138	C. Corke	136
Gunning Gap	Dwyer Bros. ...	134	T. Broderick ...	131
Dunmore	G. W. Shreeve ...	134	M. Bryant... ...	129
Fillifogi	S. A. Bloomfield ...	134	C. Corke	130
Nelungaloo	A. Scrivener ...	144	J. H. Bulfin ...	140

From the point of view of moisture content the competition fallows were generally satisfactory; subsoil moisture was good, and where a cultivation had been given immediately after the December rains, the compacted and sub-surface sections were in excellent condition. The need of this cultivation was very noticeable in some exhibits, there being an appreciable drying out to a depth of 12 inches. December, however, is a busy month, and farmers cannot be advised to leave the harvest for the purpose of working the fallows. With a few exceptions the mulch lacked full mellowness, due to working the soil when too wet or dry, or otherwise out of condition. Unfortunately this could not be avoided, but still the results stress the value of timely working when the soil contains just the right amount of moisture.

Fallowing in the Young District.

A fallow competition promoted by the Young P. and A. Society was judged by Mr. T. P. Taylor, Experimentalist, Temora Experiment Farm. The standard of the fallows submitted was very high.

The season from a fallowing point of view proved to be a difficult one in the Young district. The excessive rains experienced during the winter months made it impossible to plough until well into the spring, and then conditions were suitable only for a short period, as in the absence of spring rains the soil dried out rapidly and became too hard to plough. Further operations were then restricted until good rains in the late summer months made it possible to work the fallows while the soil was in the right condition for the destruction of weed growth and the formation of a good mulch and a well-compacted seed-bed.

Methods Employed by the Leading Competitors.

First place was awarded to Mr. H. C. Thackeray's entry. This fallow, which consisted of a medium red loam, was mouldboard ploughed 4 inches deep in July, harrowed in September, cultivated in December before harvest and again in January, and harrowed in February and March.

Mr. Thackeray prepared his fallow with much foresight and care. The mulch was excellent and showed that degree of "cloddiness" that is looked for in a good fallow. It was practically free from all weed growth and showed a good compacted seed bed. The moisture content was good and the headlands and finishes in excellent order and condition.

Messrs. A. E. Salter and Thackeray and Sons' entry filled second place. This fallow was also on a medium red clay loam, which was mouldboard ploughed in August 4 inches deep, harrowed in October, scarified in November, harrowed again before harvest, and cultivated in March. The mulch was a little on the fine side and not as good as the winning entry. The moisture content was good and the seed-bed nicely compacted. A few small weeds and some rubbish were responsible for the loss of points for cleanliness.

Mr. H. Coddington's entry was awarded third place. This fallow consisted of a light loamy soil, which was mouldboard ploughed 4 inches deep in August, harrowed in October, springtooth cultivated in October and again in January and March. The mulch on this fallow was a little fine in some places and in others the clods were too big. A small amount of weed growth was present in places, but the moisture content and compactness of the fallow were good.

POINTS Awarded in the Young Competition.

Competitor.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition.	Total.
Maximum points	35	35	35	35	10	150
H. C. Thackeray, Wootoona	32	33	34	33	9½	141½
A. E. Salter and Thackeray & Sons, Wootoona	32	32	32	32	9	137
H. Coddington, Nhill	31	31	33	32	9	136
B. G. Hambrook and Thackeray & Sons, Wootoona	32	30	32	32	9	135
C. & V. Bradford, Nubba	30	31	31	32	9	133
R. H. Thackeray, Wootoona	30	30	29	32	9	130

SUPERPHOSPHATE THE BEST FERTILISER FOR WATER MELONS ON THE HUNTER.

To test the influence of fertilisers on the yield and maturity of melons, a trial was again conducted with Mr. A. McKimm, of Bolwarra, last season on typical rich alluvial soil. The manures were applied by spreading them around the hills and hoeing in prior to planting. The seed was sown on 7th September, 1931, the variety being Grey Monarch.

The yields and returns from the ¼-acre plots were as follows :—

Fertiliser per acre.	Melons harvested.									
	To 27th Jan.		To 7th Feb.		To 11th Feb.		To 12th Mar.		Total.	
	No.	Value (6s. per doz.)	No.	Value (5s. 6d. per doz.)	No.	Value (5s. per doz.)	No.	Value (4s. per doz.)	No.	Value.
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
No manure	40	1 0 0	250	5 14 7	20	0 8 4	650	10 16 8	960	17 9 7
P12 Mixture, 522 lb....	96	2 8 0	208	4 15 4	128	2 13 4	576	9 12 0	1,008	19 8 8
P11 " 522 lb....	60	1 10 0	144	3 3 3	120	2 10 0	736	12 5 4	1,060	19 8 7
P13 " 596 lb....	104	2 12 0	132	3 0 6	128	2 13 4	468	7 16 0	832	16 1 10
M22 " 448 lb....	108	2 14 0	180	4 2 6	...	...	724	12 1 4	912	18 17 10
Superphosphate 448 lb.	92	2 6 0	200	4 11 8	Nil	...	1,008	16 16 0	1,300	23 13 8
Basic superphosphate, 560 lb.	72	1 16 0	220	5 0 10	Nil	...	976	16 5 6	1,268	23 2 4

NOTE.—P11 fertiliser comprises 6 parts superphosphate and 1 part sulphate of ammonia; P12 mixture, 6 parts superphosphate and 1 part sulphate of potash; P13 mixture, 6 parts superphosphate, 1 part sulphate of ammonia and 1 part sulphate of potash; M22 mixture, equal parts of superphosphate and bonedust.

These trials, which have now been conducted over a number of years have proved that superphosphate at 448 lb. per acre is the most profitable fertiliser to apply to the water melon crop on the rich alluvial flats of the Hunter River.—JOHN DOUGLASS, Agricultural Instructor.

Tomatoes for the Sauce Trade.

Mass Production and Distribution of Seedlings.

JOHN DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

Farmers who grow tomatoes for the sauce trade usually have only two objects in view, firstly, heavy yields, and, secondly, cheapness of production. The price paid for the tomatoes is not very high, hence little attention is given to quality. The manufacturers, however, have great difficulty in manufacturing a mixed lot of fruit. Tests carried out have shown that certain varieties are much higher in quality and quantity of pulp than other types. For several reasons past attempts to induce farmers to grow specified varieties have not proved very successful.

Making the Rows Prior to Sowing the Seed.

Last season one of the leading sauce manufacturing firms decided to follow the American system of compelling suppliers of tomatoes to grow certain varieties. This firm contracted with Mr. A. C. Wood, of Richmond, New South Wales, to raise 400,000 tomato seedlings to be supplied to farmers who had contracted with the manufacturers for the supply of tomatoes. The firm specified the variety of tomato to be grown, and that

they should be free of disease. The varieties selected were Marglobe and San Jose. The former variety has proved to be very suitable for the sauce trade in that it is a heavy producer of high quality fruit. It has alsc proved to be resistant to fusarium wilt under local conditions.

Successive Sowings.

It was found necessary to prepare 1 acre of ground to hold the required number of plants, which were grown in beds 6 feet by 66 feet. Across these beds shallow drills were made by means of a wide pronged rake. The drills were spaced 6 inches apart so that the seedlings would not be overcrowded. The first sowing of seed was made on 1st August, the beds being protected from frost by means of covers. This first lot of ten beds took fourteen days to germinate. Continuous sowings were made until 1st October. The last sowing took only six days to show above the ground. It was found that at

Showing Portion of the Area.
The framework is to enable protection to be given to the earliest sown beds.

the end of the sowing 14 lb. of seed had been used. The care of the plants sown at various periods calls for a great deal of care and judgment. The first sowings require little water, while the later sowings usually require a good deal. The plants were continually sprayed with Bordeaux mixture as a preventive of Irish blight.

Distributing Three-quarters of a Million Plants.

Mr. Wood excells in the hardening off of the plants. No seedlings are distributed until they are thoroughly hardened off and show a good, sturdy stem. The farmers call for the plants as they require them.

The method of putting up about three-quarters of a million of seedlings is worth recording. The beds are watered and the plants pulled in bundles of fifty. The roots of each bundle are puddled in a muddy mixture of cow manure and soil. Ten of these bundles are placed between the folds of a wet cornsack, with the tops of the plants protruding, and the whole is tied up ready for despatch. By this means it is possible to convey the seedlings long distances without any deterioration.

In the first week of pulling Mr. Wood despatched over 100,000 plants. The fact that all the plants were free from any trouble, and that all were sturdy, vigorous growers, is sufficient to mark Mr. Wood as an expert in this particular sphere.

Advantages of the Method.

The raising of the seedlings at one central depot has many advantages for both the farmer and the manufacturer. Besides the previously mentioned advantages the manufacturer is able to control the time of planting

Bundles of Plants with Roots Puddled.

Tied up Ready for Despatch.

and thus the time he can start up the factory. The grower on the other hand is relieved of the responsibility and worry of raising the seedlings at home. The ideal type of plant is supplied to each grower just at the correct time for field transplanting. The plants are free from disease and pests, are well hardened off, and will give better results even in summer time than the plants that are raised with less care. Another point worth considering is that a farmer is able to obtain just the right number of plants to fill a certain area; about 1,500 seedlings per acre are required. If growing these seedlings himself, it is a difficult job to judge with any degree of accuracy the number of plants growing in the beds.

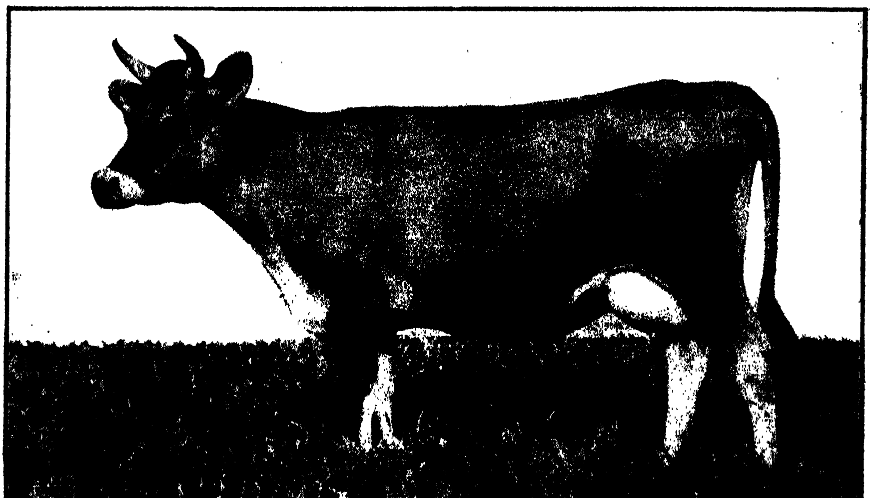
A Novel Rotation.

Mr. Woods' method of rotating the ground for the staked tomato crop should interest many readers. During the first season the ground is cropped to staked tomatoes, and as the end of the crop approaches the paddock

is fenced off with wire netting and converted into a poultry run. The poultry keep the weeds and any insects in check and maintain the land in bare fallow for one season, after which it is again put down to tomatoes. This country is badly infested with the dreaded nut grass, but it has been Mr. Woods' experience that the poultry, although not killing the plant, will keep it well in check. Moreover, the soil is enriched as the result of twelve months' accumulation of poultry droppings, giving the young plants good growing conditions the following year. On a small farmlet this method of rotation gives the land a spell after a heavy crop and allows the poultry to have a fresh run at regular intervals.

Richmond Posy V Establishes World's Butter-fat Record.

Richmond Posy V, by producing 1,081.68 lb. butter-fat for a 365 days' test, beat the previous world's record for a senior three-year-old Jersey, which was held by an American cow, Rinda's Rosaire Tessie, with 38.27 lb. butter-fat less than Richmond Posy V's new record.



Richmond Posy V.

For the 273 days' record of her test Richmond Posy V established a new Australian butter-fat record for all breeds under four years—812.65 lb. butter-fat—while the full year's figures constitute an Australian record for all breeds under five years.

Richmond Posy V is closely related to the well-known producer Wagga Gladys, who at one time held the world's Jersey record for all ages.

Posy V's record was established on twice-a-day milking and without any special feeding or treatment.

The Prevention of Caseous Lymph-adenitis.

(Cheesy Glands in Sheep.)

H. R. SEDDON, D.V.Sc., Director of Veterinary Research, and
H. G. BELSCHNER, B.V.Sc., District Veterinary Officer.

Investigations during the past three years in Australia have given us strong reasons for believing that sheep contract this disease mainly at time of shearing, it having been shown that if shear cuts are "experimentally" infected with the causative microbe the glands become diseased in the same fashion as occurs in natural cases. Actual proof, however, that "natural" cases of the disease have been contracted at shearing has hitherto been lacking, and the purpose of this paper is to detail an experiment carried out by us at Nyngan Experiment Farm with the co-operation of the manager, Mr. S. Rudkin, and the assistance of Mr. C. R. Mulhearn, B.V.Sc.

Details of the Experiments.

Four groups of Merino wethers, each comprising fifty sheep, were shorn, two with blades and two with machines, at three consecutive shearings, each group being handled in exactly the same manner at each shearing. The four groups of sheep were run together during the whole period of the experiment. The sheep were then fattened and slaughtered at Homebush abattoirs, when the extent of caseous lymph-adenitis in them was carefully determined by the meat inspectors acting under Mr. G. K. Thorpe, Chief Veterinary Inspector.

Groups A and B.—These were blade shorn and great care was taken with Group A in order that they might be wounded as little as possible. As a result they sustained few cuts indeed and such as did occur were insignificant in nature. In Group B no such care was taken and it was estimated that at each shearing the average cuts per sheep would be about four, the wounds being more severe than the cuts sustained by Group A sheep. The sheep were shorn on the same day and on the same board and they were in all respects treated exactly alike.

Examination after slaughter showed no cases of caseous lymph-adenitis at all in the Group A sheep, but one case in Group B. The entire absence of cases of caseous lymph-adenitis in Group A and the presence of one case in Group B constitute some evidence that the extra wounding was responsible for infection.

Comparison of Group B and Group C.—Both these lots were shorn on the same board and passed through the same yards and the only difference was that sheep in Group B were shorn with blades, whereas those in Group C were machine shorn. Both were wounded, but naturally those machine shorn

suffered most. As only 2 per cent. of Group B showed lesions of caseous lymph-adenitis, whereas 18 per cent. of Group C became affected, it is evident that the type of wounding resulting from machine shearing must favour infection much more than the wounding which occurs from blade shearing.

Groups C and D.—These were machine shorn in the ordinary way at each shearing and were, of course, wounded to the usual extent done by even careful shearers. Actually our records show that the sheep in Group D were wounded to a slightly greater degree than those in Group C. The sheep were brought into the yards together, shorn together, and the only difference in handling was that, whereas Group C sheep were passed through the counting-out pens in the ordinary way, Group D sheep were passed from the board out through the wool-loading door, joining Group C as these sheep were let out from the yards.

On examination of these sheep at the abattoirs a remarkable difference was found, 18 per cent. of the sheep in Group C showing lesions of caseous lymph-adenitis, whereas none of the group D sheep was affected. On being shorn the sheep of the latter group had been sent direct from the shearing board to the paddock, thus having no contact with the counting-out pens or sheepyards after being shorn, and the absence of cases of caseous lymph-adenitis in them is apparently due to this fact.

TABLE Giving Summary Results of the Experiment.

	How Shorn.	How Released after Shearing.	Percentage Infected.
			per cent.
Group A ...	Blade shorn ...	Through counting-out pens and yards ...	0
„ B ...	„ ...	„ „ „ „ ...	2
„ C ...	Machine shorn	„ „ „ „ ...	18
„ D ...	„ „ ...	Direct to paddock	0

Conclusions from the Experiment.

1. Shearing with blades in such a fashion as not to wound the sheep (or to wound it to only a very slight degree) resulted in no lesions of caseous lymph-adenitis.

2. Machine shearing is more likely to be followed by caseous lymph-adenitis than is blade shearing.

3. Infection may be prevented even in machine shorn (and hence wounded) sheep by keeping them away from infected counting-out pens and yards.

4. There is every indication that infection is not gained in the paddock, but in the yards.

Infection Contracted During Actual Shearing Process.

In the above experiment there were no cases where abscesses were cut into or ruptured during actual shearing. Had this occurred the cutters would no doubt have become infected and such infection might have been carried

to other sheep. Further, sheep with such opened abscesses might, in crowding among other sheep in the yards after shearing, have rubbed such pus against wounds in these neighbouring sheep.

Danger Points and their Avoidance.

From what has been said it appears certain that in the spread of caseous lymph-adenitis the sources of danger are :—

(*a*) *Degree of wounding.*—In machine shearing it is not possible wholly to avoid wounding, and further, the type of wound sustained is such that a pocket is formed, thus retaining infection gathered from dirt. By careful supervision, however, the shearing of the sheep can be much improved and wounding very much minimised, so that the liability of animals contracting the disease may be lessened.

(*b*) *Spread of infection on the shearing board.*—This undoubtedly occurs. A sheep with discharging lesions may come on the board, or an abscess actually burst whilst the sheep is being shorn. Provision might be made for such sheep to be removed to a special pen so as to prevent their going down the chute with the other sheep, for if they do they will then spread the infection in the counting-out pens, &c. The handpiece in use should be cleansed and the cutters and combs disinfected.

Dried pus may be present in the wool and to avoid spread of this from sheep to sheep owners have adopted the practice of laying the end of the hand-piece in a shallow tin of disinfectant so that the cutters are bathed with this whilst not actually in use.

A thorough disinfection of the shearing board before shearing and during each week-end should be undertaken.

(*c*) *Infection from chutes, counting-out pens and yards.*—From our experiments this is the commonest source of infection and it should therefore receive first consideration in combating the disease. If the chutes and counting-out pens can be made of such type that infection cannot exist there it would appear that caseous lymph-adenitis might be almost entirely prevented. How this might be done will be described later.

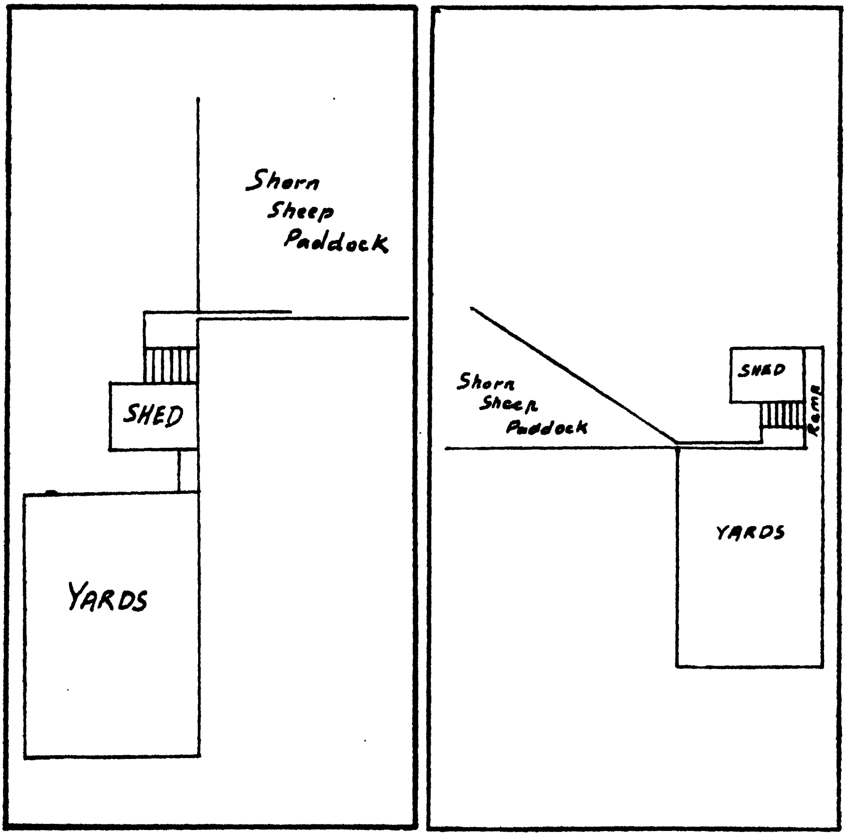
Other Field Observations.

Some years ago a large number of flocks were examined to determine the extent of caseous lymph-adenitis, when it was remarked that the lowest percentage was found in the case of a shed so arranged that the sheep passed direct from the counting-out pens and branding race to the paddock without going through the working yards, the counting-out pens being thoroughly cleaned-up and re-gravelled before each shearing.

We have records also of sheep shorn, some twice and others once, in a new shed (with new yards), and it was not surprising, therefore, to find that of these sheep only 2 per cent. showed lesions of caseous lymph-adenitis. This shed and the yards were very carefully cleaned up following the first shearing and if such care is persisted in the yards should never become the danger that many of the older sheds and yards now present.

Suggested Lay-out of Shed and Yards to Prevent Caseous Lymph-adenitis and other Wound Infections.

It is quite a common practice for newly-shorn sheep to pass from the counting-out pens and branding race into the ordinary working (drafting) yards. These yards have a dusty surface, and it necessarily follows that the wounds on the sheep become contaminated with this dust. This is the big danger, for this dust commonly contains the germs of caseous lymph-adenitis. If, therefore, as shown in our experiments, such dust contamination can be avoided one may expect to reduce the disease enormously.



Plan No. 1. **Plan No. 2.**
Suggested Designs for the Lay-out of Sheds and Yards.

The aim should be to get the newly-shorn sheep out on to grass as soon as possible and by simple methods shed and yard design may be so arranged. Further, many existing sheds can, at little expense, be so converted.

Either of the two designs given above might be adopted, though the first is to be preferred, as dust from the drafting yards would not then be blown on to the newly-shorn sheep.

Plan No. 1.—In this case the counting-out pens would be placed on the side of the shed opposite to the drafting yards. The sheep from the counting-out pens would pass to a small collecting yard and from this through the branding race to the "shorn sheep paddock."

Plan No. 2.—Here the yards might be on the same side of the shed as the drafting yards, but with the important provision that there must be no connecting gate between the drafting yards and the pens and race that newly-shorn sheep pass through.

What has been termed the "shorn sheep paddock" is a very necessary part of the lay-out, and it is important that the surface should be grass covered in order that dust might be minimised. For the same reason it should be several acres in extent and should not be used for holding any other than newly-shorn sheep. Objection may be raised on this score, but an inspection of the area around many a shed has shown that it could usually be provided without any great difficulty.

Construction of Counting-out Pens.

By a small additional expenditure in cost of erection the counting-out pens can be so made that there is no difficulty in keeping them clean. The ground surface should be concreted and the same material should cover the yards into which the counting-out pens open, and also the floor of the branding race.

Iron piping with strong netting laid on would provide the best material for the fences between the pens, but, failing that, smooth timber should be used.

If one works on the principle of getting shorn sheep out of the yards and on to grass as soon as possible after shearing it will be found that the pens need not be as large as those frequently provided and the cost may be thereby reduced.

Above All, Avoid Dust Contamination of Wounds.

The important factor in the prevention of caseous lymph-adenitis is to avoid dust contamination of wounds. This can very largely be prevented by the adoption of the principles indicated. Remember that in doing this you are also guarding against tetanus and blood poisoning.

A Further Note on Wound Infections of Sheep.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon, and E. A. ELLIOTT, Sheep and Wool Expert.

The foregoing article by Dr. Seddon and Mr. Belschner clearly demonstrates the main source of infection by caseous lymph-adenitis. Obviously the recommendations made for prevention of the disease mainly concern the construction of new sheds or the structural alteration of existing ones where that is possible. In this note it is desired to add a few suggestions regarding

present sheds which are structurally unsound from the disease prevention point of view, and which could perhaps only be altered at a prohibitive cost, taking present circumstances into account.

It is often noticed that when the floor of the shed is swept, any foreign matter and excreta lying on the board are swept down the chutes to the counting-out pens, which thus become even dirtier than they were before. These pens are placed in various positions, depending on the type of the shed, and in many of our larger sheds they are underneath the sweating pens, with outlets flush with the outer wall of the shed. If a shed is built on piles of sufficient height to allow a man to work comfortably under the shed it can be expected that the counting-out pens will be kept reasonably clean, though cases have been seen where even under such circumstances, the dirt has been allowed to accumulate. The counting-out pens under a shed which is only three feet or so above the ground will generally be found very dirty, and such conditions can be expected to cause a good deal of infection by caseous lymph-adenitis and other diseases. With smaller sheds the counting-out pens are usually outside the shed and normally should not become very dirty. At any rate they can be easily cleaned and kept more free from infection than when the pens are under the shed.

As pens underneath the shed will always be hard to keep clean and will be a constant source of infection (disease germs favour dark and damp situations), it is recommended that when the shorn sheep have to be passed through a chute under the shed the counting-out pens might with advantage be placed outside the shed, with only narrow lanes under the shed. The sheep will natuıally come towards the light and very few will stay under the shed. These narrow lanes could also have concrete floors, which could be easily kept clean.

Officers visiting a farm or station sometimes feel a certain hesitancy in telling a stockowner to his face that his shearing shed and its surroundings are filthy, but the epithet could at times be applied with justice. Overhead expenses cannot be sustained as they used to be, and preventable mortality and diseases are a heavy load on overhead expenses. Moreover, a dirty shed is a dangerous shed.

Some "Don'ts" for Fat Lamb Raisers.

Don't forget to class your breeding ewes.
Don't use inferior rams or nondescript types.
Don't export unless you have the best.
Don't try to place too many lambs in your first draft.
Don't handle lambs carelessly.
Don't use sticks or grab the wool of lambs when loading into trucks.
Don't have a protracted lambing.
Don't check the lambs.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date.
E. C. Nicholson, Jillamatong, Corowa ...	134	2 July, 1932
P. Ubrihien, Corridgeree, Bega ...	133	2 ,, 1932
Grafton Experiment Farm (Ayrshires) ...	193	4 ,, 1932
Hurlstone Agricultural High School, Glenfield ...	53	9 ,, 1932
St. John's College, Woodlawn, Lismore ...	40	11 ,, 1932
Gladesville Mental Hospital ...	40	14 ,, 1932
Coast Hospital, Little Bay ...	66	15 ,, 1932
Lunacy Department, Parramatta Mental Hospital ...	33	16 ,, 1932
William Thompson Masonic School, Baulkham Hills ...	45	16 ,, 1932
W. Hammond, Bellingen ...	68	16 ,, 1932
W. R. Boughton, Holbrook ...	22	27 ,, 1932
Chapman Bros., Farm 166, Stoney Point, Leeton ...	31	28 ,, 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys) ...	42	13 Aug., 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook ...	32	13 ,, 1932
A. L. Logue, Thornboro, Muswellbrook ...	41	14 ,, 1932
E. E. Winder, Wybong Road, Muswellbrook ...	46	14 ,, 1932
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1932
A. H. Webb, Quarry Road, Ryde ...	4	24 ,, 1932
E. E. McMullen, Springnook, Holbrook ...	32	25 ,, 1932
E. P. Perry, Nunderah, Parkville (Guernseys) ...	30	25 ,, 1932
Sacred Heart Convent, Bowral ...	10	26 ,, 1932
Department of Education, Gosford Farm Homes ...	38	2 Sept., 1932
James McCormack, Tumut ...	98	9 ,, 1932
Wagga Experiment Farm (Jerseys) ...	64	16 ,, 1932
S. L. Wills, Greendale Dairy, Cowra ...	31	16 ,, 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	67	16 ,, 1932
St. Patrick's College, Goulburn ...	7	21 ,, 1932
E. S. Cameron, Big Plain, Narrandera ...	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	99	29 ,, 1932
W. W. Martin, "Narooma," Urana Road, Wagga ...	141	13 Nov., 1932
Wolaroi College, Orange ...	11	19 ,, 1932
Lunacy Department, Callan Park Mental Hospital ...	31	20 ,, 1932
Berry Experiment Farm ...	129	26 ,, 1932
J. B. Burtenshaw, "Sunnyside," Inverell ...	36	27 ,, 1932
Parker Bros., Hampton Court Dairy, Inverell ...	74	27 ,, 1932
W. K. Frizell, Rosenstein Dairy, Inverell ...	44	28 ,, 1932
J. L. W. Barton, Wallerawang ...	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood ...	8	3 ,, 1932
Wollongbar Experiment Farm, Lismore (Guernseys) ...	119	3 ,, 1932
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	9	3 ,, 1932
A. N. de Fraine, Happy Valley Dairy, Inverell ...	9	6 ,, 1932
W. Pigg, Redlands Dairy, Inverell ...	33	6 ,, 1932
Lunacy Department, Morisset Mental Hospital ...	27	7 ,, 1932
J. F. Chaffey, Glen Innes (Ayrshires) ...	58	15 ,, 1932
Newington State Hospital and Home ...	100	17 ,, 1932
W. T. Herbert, Racecourse Farm, Bega ...	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega ...	78	8 ,, 1933
J. Davies, Puen Buen, Scone (Jerseys) ...	147	14 ,, 1933
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	80	22 ,, 1933
New England Experiment Farm, Glen Innes (Ayrshires) ...	41	28 ,, 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	21	28 ,, 1933
Bathurst Experiment Farm (Jerseys) ...	31	1 Feb., 1933
New England Girls' Grammar School, Armidale ...	29	3 ,, 1933
Lidcombe State Hospital and Home ...	149	3 ,, 1933
G. L. Genge, "Easton," Armidale ...	33	4 ,, 1933
A. B. Finney, Fox Ground, Gerringong ...	29	11 ,, 1933
George Rose, Aylmerton ...	3	23 ,, 1933
Riverina Welfare Farm, Yanco ...	89	24 ,, 1933
Department of Education, Yanco Agricultural High School ...	39	24 ,, 1933
Mittagong Farm Homes ...	36	24 ,, 1933
Liverpool State Hospital, Liverpool ...	72	3 Mar., 1933
Miss Brennan, Arankamp, Bowral ...	17	8 ,, 1933
G. W. Young, "Boorganna," via Wingham ...	41	10 ,, 1933
Lunacy Department, Kenmore Mental Hospital ...	79	27 ,, 1933
P. M. Burtenshaw, Killean, Inverell ...	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra ...	20	6 ,, 1933
A. D. Frater, "Fairview Dairy," Inverell ...	51	6 ,, 1933

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
A. H. Pye, Loch Levan, Inverell	47	7 April, 1933
W. Newcomb, "Minnamurra," Inverell	72	7 ,, 1933
Rydalmere Mental Hospital	77	7 ,, 1933
St. Joseph's Girls Orphanage, Kenmore	11	13 ,, 1933
St. Joseph's Convent, Reynold-street, Goulburn	3	14 ,, 1933
St. Michael's Novitiate, Goulburn	4	14 ,, 1933
Marion Hill Convent of Mercy, Goulburn	47	15 ,, 1933
G. A. Parish, Jerseyland, Berry	93	21 ,, 1933
Australian Missionary College, Cooranbong	64	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1933
Koyong School, Moss Vale	3	11 ,, 1933
James Wilkins, "Jerseyville," Sandy Creek Road, Muswellbrook	40	12 ,, 1933
Tudor House School, Moss Vale	14	13 ,, 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 ,, 1933
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 ,, 1934

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN MAY.

THE following outbreaks of the more important infectious diseases were reported during the month of May, 1932:—

Anthrax	Nil.
Blackleg	7
Piroplasmosis (tick fever)	1
Pleuro-pneumonia contagiosa	9
Swine fever	Nil.
Contagious pneumonia	2
Necrotic enteritis	1

—MAX HENRY, Chief Veterinary Surgeon.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Wentworth	July	13
Cootamundra Sheep Show (G. B. Black)	,,	20, 21
Tullamore (S. D. Cameron)	,,	27
Young Sheep Show	,,	27, 28
Peak Hill, (W. R. L. Crush)	Aug.	2, 3
Trundle (D. Leighton)	,,	9, 10
Condobolin (J. M. Cooney)	,,	16, 17
Gilgandra	,,	16, 17
Wagga Wagga (F. H. Croaker)	,,	23, 24, 25
Bogan Gate (J. a'Beckett)	,,	24
Parkes (L. S. Seaborn)	Aug.	30, 31
Forbes (E. A. Austen)	Sept.	6, 7
Galston	,,	9, 10
Lockhart	,,	21
Berrigan (R. Wardrop)	,,	28
Hay	,,	28, 29
Narrandera (J. D. Newth)	Oct.	4, 5
Corowa (H. G. Norton)	,,	13, 14
Griffith (M. E. Sellin)	,,	18, 19
Cootamundra (G. B. Black)	,,	25, 26

Citrus Maturity Tests.

Resumé of Three Years' Experiments, 1929–31.

R. J. BENTON, Special Fruit Instructor, and F. T. BOWMAN, B.Sc.Agr., Fruit Instructor.

During the past ten years the production of citrus fruits in New South Wales has increased from 1,984,700 bushels (in 1922) to 2,935,700 (in 1931). Naturally, competition for the available markets has become keener, and consequently such factors as palatability and appearance—important considerations in stimulating the consumption of such fruits as oranges—must claim attention. Skin colour alone has not been found to be a true guide to ripeness or palatability, and tests were therefore undertaken to find some constant factor associated with mature fruit. After analysing some 600 samples—mostly oranges, but also including mandarins and grape fruit—it was found that the acid content of the fruit, which is determined by a simple test that can be applied by growers, bears a constant relationship to palatability.

This article not only surveys the results of the three years' experiments, but also describes how to carry out the acidity test.

PALATABILITY of oranges, the chief feature of which is sweetness, is a result of chemical changes in the fruit during ripening. With the object of following the process of ripening from the aspects of composition, taste, texture, and juice content, and of finding a factor in the composition constant for mature fruit, citrus maturity tests were undertaken by the Department of Agriculture during 1929, 1930, and 1931. Representative samples of main crop citrus were collected from the same tree and tested at fortnightly intervals. The fruits were obtained from such widely-separated districts as Grafton, Gosford, Mangrove Mountain, Kurrajong, Windsor (or Hawkesbury River), Glenorie, and Leeton. The varieties included Washington Navel, Thompson Navel, Late Valencia, White Siletta and Paterson River oranges, Emperor mandarin and Marsh grape fruit.

Last season much definite information was also obtained by following separately the maturity rate of fruit of different sizes and that of cool and common stored fruit. The maturity tests thus took into account the effect of such factors as variety, district, size and storage on the maturity rate of citrus fruit.

The results of these tests, some 600 in number, are too voluminous for publication in detail and only the salient points are discussed in this article.

Simple Explanation of the Process of Ripening.

The juice of citrus fruit contains two kinds of sugars, namely, cane sugar (sucrose) and fruit sugar (fructose), together with soluble organic acids, chiefly citric acid, small amounts of soluble organic compounds other than sugar or acid, and lastly, soluble mineral matter or ash. Collectively, these substances are referred to as "total soluble solids."

During ripening the sugar fraction increases and the citric acid decreases, and this is responsible for the change from the sour taste of the immature to the sweet taste of mature orange.

Now, whilst the sugar fraction increases during ripening it is subject to some fluctuation, but the acid content decreases very uniformly throughout the season. Hence the ratio of acid to total soluble solids shows some variation, whilst the acid content is fairly constant for oranges of a certain ripeness. It is therefore considered that the acidity test is the best means of determining the maturity of oranges. This test, moreover, is a simple one and capable of being used by any grower. It is described toward the end of this article.

The following table gives a classification of the 544 samples tested during 1929, 1930, and 1931 according to their taste in the different acidity ranges.

TABLE I.—Showing Palatability in Relation to Acid Content.

No. of c.c. of $\frac{N}{10}$ Soda required to neutralise 10 c.c. of juice.	Taste.	No. of Oranges.					No. of. Emperor Mandarin.	No. of Marsh Grape Fruit.
		Washington Navel.	Valencia.	Common.	Thompson Navel.	Total.		
c.c								
Below 20	Sweet...	93	42	23	28	186	80	1
	Tart ...	7	2	8	1	18	1	0
	Sour ...	0	0	0	0	0	0	0
20·1 to 23	Sweet...	10	10	2	2	24	1	0
	Tart ...	20	6	3	1	30	3	0
	Sour ...	1	1	1	0	3	0	0
23·1 to 26	Sweet...	0	3	0	0	3	0	0
	Tart ...	5	4	3	0	12	2	0
	Sour ...	2	3	6	0	11	0	0
26·1 to 30	Sweet...	0	3	0	0	3	0	0
	Tart ...	3	9	8	0	20	2	0
	Sour ...	8	9	9	0	26	6	3
Above 30	Sweet...	0	1	0	0	1	0	0
	Tart ...	0	0	2	0	2	0	0
	Sour ...	0	9	13	0	22	3	16
	Very sour	0	8	14	0	22	0	43

The foregoing table plainly shows that acid content bears a constant relationship to taste in the different varieties of oranges and mandarins, and probably in grape fruit as well, although further tests with this fruit are desirable. In the lower range (below 20) oranges are mostly sweet; in the higher ranges (above 26) mostly sour; in the intermediate ranges mostly tart and sweet between 20 and 23; and sour, tart and sweet between 23 and 26. Speaking generally, the stage at which oranges are usually no longer sour to the taste is when not more than 23 c.c. of deci-normal caustic soda are required for the acidity test. Even when oranges are picked at this stage the picking will include a proportion of tart fruit.

In regulations dealing with citrus maturity standards, the stage of maturity required at picking time by law is sometimes expressed as a ratio between acid content and the total soluble solids. California, for example, requires a ratio of 1:8 and South Africa a ratio of 1:5 for seedling oranges, 1:5.5 for Valencia, and 1:6 for Navel oranges. Or it may also be expressed as acid content only, without reference to the total soluble solids. This is the case in Australia, where the present regulation classes Navels as "immature" when more than 26 cubic centimetres of deci-normal caustic soda are required to neutralise the acidity in 10 cubic centimetres of juice; oranges other than Navels and White Siletta as "immature" when more than 30 c.c. of deci-normal soda are required to neutralise the acidity in 10 c.c. of juice; and White Silettas as "immature" when the whole of the skin of the orange has not naturally reached an orange colour. Comparing the relative sweetness of oranges conforming to the maturity standards of the three countries, California provides for a sweeter standard than Australia and South Africa. The present Australian regulations allow growers to pick fruit of a fairly high acid content; however, the data in Table I suggests that the 23 c.c. test might be adopted as the maximum for determining the stage at which to pick—the object being to ensure the marketing of sweet fruit.

Time of Ripening.

The period at which the desired stage of maturity was reached in these tests is shown in Table II. The actual date varies somewhat from year to year according to seasonal and local conditions. For example, this stage was reached about a fortnight earlier in 1931 than in 1930. According to samples received, the present season appears to be later than the dates shown in Table II. This variation emphasises the desirability of using the acidity test each year as an index of maturity.

TABLE II.—Showing Period at which Oranges and Mandarins from different Districts reached the 23 c.c. Standard of Maturity.

——	Grafton.	Gosford	Mangrove Mountain.	Windsor.	Glenorie.	Kurrajong.	Leeton.
Thompson Navel.	....	*First week May.	*First week May.	*First week May.	....	....	....
Washington Navel.	*Last week April.	First to second week May.	First to second week May.	First to second week May.	First to second week May.	Second week June.	Second week June.
Common Siletta.	....	Second week June.	Second week July.	Second week August.	Second week June.	*Third to fourth week September.	*First week November.
Valencia ...	Third week July	Fourth week August to first week September	Second week August.	Fourth week August.	Third week September.	First week December.	Second week October.
Mandarins ...	First week May.	Second to third week May.	Second to third week May.	First week May.	First week May.	Third week May.	*Third week July.

* Estimated from over-mature or under-mature samples received.

Relationship of Size to Maturity.

It was also observed during these trials that at any particular stage there was a more or less definite relationship between size and ripeness as regards fruit on the same tree. The smaller fruit was found to be rather more

acid than larger fruit, and consequently the latter may be sweet whilst the smaller fruit on the same tree is still tart or sour.

TABLE III.—Showing No. of c.c. required for the Acidity Test.*

Size of Fruit.†	Dates.					
	19 August, 1931.	1 September, 1931.	15 September, 1931.	29 September, 1931.	13 October, 1931.	18 November, 1931.
	c.c.	c.c.	c.c.	c.c.	c.c.	c.c.
Large ...	29·9	26·9	27·6	27·5	21·7	15·8
Small ...	32·7	28·3	......	31·0	26·5	16·6

* 23 c.c. and less indicate a sweet taste. † Leeton Valencia oranges.

Ripening Retarded After Picking.

These tests have also demonstrated that although oranges continue to ripen after picking, as evidenced by a decrease in acidity, the process is slower in storage than on the trees, and slower again when the fruit is cold stored at 42 deg. Fahr. (see Table 4). Cold storage, therefore, suggests itself as a means of preventing Valencia oranges becoming over-sweet, or insipid, and dry on the trees. It should also make it possible to keep up the supply of good eating quality oranges over a much longer season.

In this connection it is important that care be taken to preserve the condition of the fruit by careful handling. If the fruit is harvested at the proper stage of maturity, handled carefully and wrapped, the storage life is lengthened and ripening will proceed more evenly and completely.

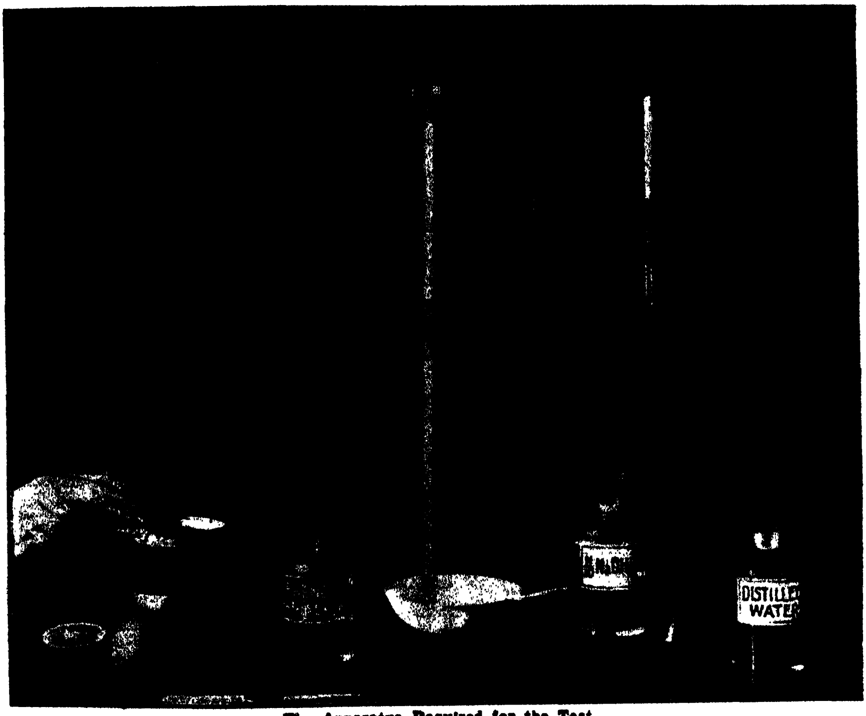
TABLE IV.—Showing Decrease in Acid Content of Valencia Oranges.

Date.	(1) Picked Castlereagh, 25 August, 1931, not wrapped, common stored.		(2) Clipped Leeton, 25 August, 1931, wrapped, common stored.		(3) Leeton fruit, left on tree till required for testing for comparison with (2).		(4) Grafton fruit, cool stored at 42 deg. Fahr. for comparison with (1) and (2).	
	Acid test.*	Percentage of juice.	Acid test.*	Percentage of juice.	Acid test.*	Percentage of juice.	Acid test.*	Percentage of juice.
1931.								
19 August ...	...	...	...	...	29·9	41·3	...	...
28 ,, ...	33·0	41·3	31·5	41·7	...	...	...	...
1 September...	...	...	...	...	26·9	44·4	...	...
4 ,, ...	32·7	44·7	28·8	40·9	...	...	...	...
11 ,, ...	32·7	44·1	24·9	43·2	...	...	...	...
15 ,, ...	...	...	...	...	27·6	45·1	21·9	50·7
18 ,, ...	31·3	43·1	24·2	42·2	...	...	...	...
29 ,, ...	...	...	...	...	27·5	38·1	...	...
13 October ...	30·4	45·7	25·8	42·2	†21·7	42·1	...	...
5 November...	27·8	50·7	25·7	46·6	...	...	...	...
13 ,, ...	...	...	†22·9	48·8	15·0	44·1	...	...
27 ,, ...	...	...	...	...	...	...	18·2	55·4

* Cubic centimetres of $\frac{N}{10}$ NaOH required to neutralise 10 c.c. of expressed juice.
† Compare the dates on which these oranges reached a maturity of 23 c.c. or less.

Both Lots (1) and (2) were in poor condition and shrunken before the accepted standard of sweetness (23 c.c. $\frac{N}{10}$ NaOH required to neutralise 10 c.c. of expressed juice) was reached, indicating that if oranges as immature as these samples were when picked (over 30 c.c. $\frac{N}{10}$ NaOH were required to neutralise 10 c.c. juice) are held in common storage they will not ripen satisfactorily.

Lot (2) maintained condition longer than Lot (1) and showed a greater decrease in acid content, from which it may be taken that the treatment given (clipping and wrapping) is a decided help in ripening and maintaining condition in oranges.



The Apparatus Required for the Test.
Note inverted position of the burette and the cover over the pipette when not in use.

The Acidity Test Described.

The acidity test is simple and reliable, provided attention is given to the following details:—

(1) The glassware used is kept clean and dry.

(2) The sample of oranges tested is representative of those to be picked.

(3) The 10 cubic centimetres of juice is measured accurately.

(4) The deci-normal caustic soda is truly deci-normal.

(5) A permanent, faint pink colour is obtained in the juice to indicate the end point of the test.

Using the Pipette to Measure out 10 c.c. of Orange Juice.

Adding the $\frac{N}{10}$ NaOH to the Diluted Orange Juice.

Apparatus Required.

Small bottle of deci-normal caustic soda ($\frac{N}{10}$ NaOH).
Small bottle of phenolphthalein (an acid indicator).
Small bottle of distilled water.
Conical glass "lemon squeezer."
Strainer of 30 meshes to the inch (coffee strainer).
Several glass beakers or containers.
Pipette of 10 cubic centimetres capacity.
White porcelain basin.
Glass stirring rod.
Burette of 50 cubic centimetres capacity and burette stand.
Glass funnel.

The glass apparatus should be kept clean by washing in water, preferably rain water. Should it become greasy it may be cleaned by rinsing with a warm mixture of powdered potassium bichromate and sulphuric acid.

The Procedure.

The method of carrying out the test is as follows:—

1. Secure a representative sample (three to six fruits) of the oranges it is intended to pick.

2. Extract the juice by halving and squeezing on the conical glass squeezer, then straining the juice into a glass beaker or container.

3. Take 10 cubic centimetres of the juice by means of a pipette and transfer it to a porcelain basin. Dilute the juice by adding about 30 c.c. distilled water, and also add three to five drops of phenolphthalein.

Care should be exercised to obtain exactly 10 c.c. of juice in the pipette This is done by sucking the juice up above the 10 c.c. mark on the pipette then quickly slipping the tip of the first finger over the top opening of the pipette. Remove the pipette from the mouth, hold it in a perpendicular position and with the 10 c.c. mark level with the eye, and then allow the juice to drain out slowly, by rotating the pipette, until the juice reaches the mark. Then transfer the 10 c.c. of juice to the porcelain basin, allowing the pipette to drain out completely.

4. Next fill a burette, which is held in a stand, with standardised deci-normal caustic soda, using the funnel. Care should be taken that no caustic soda runs down the outside of the burette; if this does happen, the burette should be carefully wiped. The soda is then allowed to run out slowly until the portion below the tap is filled with soda and free of air bubbles. Then run out further until the soda in the burette rests at the "o" mark. If you over-run the mark and the soda falls below "o," fill up again and run out till the mark is reached.

5. Place the porcelain basin of diluted orange juice (containing a few drops of phenolphthalein) under the burette and allow the caustic soda to run in very slowly, stirring constantly, until a faint pink colour first appears. The burette tap is then turned off. If the pink colour is permanent for a minute or so the end point has been reached. If not, a few drops more soda should be added from the burette till the colour is permanent for a minute

or so. The reading is then taken on the burette to ascertain the number of cubic centimetres of soda used to neutralise the 10 c.c. of orange juice under test. Phenolphthalein is an indicator which remains colourless in acid solution, but changes to pink in an alkaline solution. When a permanent pink colour occurs in the dilute orange juice this means that all acid has been neutralised by the soda solution. Therefore, the amount of soda solution used is an arbitrary measure of the acid present in the juice.

It should be of interest to compare the figure obtained and the taste of the sample with the results shown in Table 1. It will usually be found that oranges requiring 23 c.c. or less for the test are no longer sour to the taste, and are consequently suitable for picking.

Acknowledgments.

The writers wish to thank the growers in the different districts who supplied fruit. Acknowledgment is also made of the helpful co-operation of the Chemist's Branch and district orchard inspectors.

CHLOROPHYLL A FACTOR IN PREVENTING OSTEOMALACIA.

IN *The Agricultural Gazette* for 1st May, 1923, a short article appeared entitled "Two Factors in Disease Prevention," the disease chiefly under consideration being osteomalacia (bone-chewing). In that article the value of the supply of bone meal for many of the cattle running on the poorer coastal country and the equally high value of the supply of small quantities of actually growing green feed were emphasised. It was pointed out that much of the country being calcium deficient, and the drain of calcium from a milking cow being heavy, it was necessary to do everything possible to enable the animal to utilise calcium present in the food. Actual experience in the field had shown the benefit of providing in late winter and early spring months a small quantity of growing green feed for cows. Based on the knowledge available at that time, the suggestion was made that this was probably due in part at least to the vitamine content of such green food.

Recent work published in German journals provides a further explanation. It appears that chlorophyll, the green colouring matter of plants, has, according to the authors under consideration, a definite action in assisting animals to utilise the calcium in their feed. On the other hand, chlorophyll which has been changed by the influence of drought, heat or acid fermentation prevents this utilisation. When calcium is not properly utilised, osteomalacia is likely to occur. There is indicated, therefore, in this work, an additional reason for providing some growing green crop for the cattle during the months when the ordinary pastures are at their worst.

It was pointed out in the article in 1923 that although the ideal might be to provide sufficient fodder crop to feed the cattle in the winter, yet where that is not practicable great benefit could be derived by providing sufficient green feed to enable the cattle to receive small quantities daily or even intermittently. Both barley and oats grown for winter and spring feed had been found to be of very marked value in the direction indicated. —MAX HENRY, Chief Veterinary Surgeon.

Orchard Notes.

JULY.

C. G. SAVAGE and W. LE GAY BRERETON.

Varieties of Deciduous Fruits Recommended.

THE Department receives many inquiries during the winter months as to suitable varieties of deciduous fruit trees to plant, so that the following remarks on the subject should be of general interest. However, these recommendations should not be taken as a suggestion that our area under fruit should be increased. At the present time it is difficult to find a satisfactory market for the fruit produced, and it would seem wise to concentrate on present areas, aiming at the production of a greater percentage of high quality fruit, and to endeavour to expand our markets.

When dealing with deciduous fruit varieties it is convenient to divide the State into regions. It must not be assumed that all parts of these regions are suitable for fruit growing, but within those regions there are localities (sometimes only very limited in area) where suitable conditions can be found.

Region A (The Coastal Fringe).

This region consists of the strip of the coastal district south of the Manning River, where, through the influence of the sea, the winter frosts are only slight. In the district north of the Manning River it is wiser to concentrate on fruits that are more suitable for the climate.

Peaches.—In this region the first early maturing peaches, many of which blossom before the winter is over, can be grown because of the absence of severe frosts. To bring these first early varieties up to marketable size, however, it is necessary to have a sufficient water supply for use during dry spells, for without water then the fruit is likely to be worthless. These first early varieties of peaches generally have a rather irregular, prolonged blossoming period, which probably accounts for some irregularity in their order of ripening. As a rule Governor Rawson commences to ripen a few days earlier than Watts Early, and since Watts Early matures its crop over a rather long period, these two varieties make a good combination to cover the very early peach period. Braddocks is another variety which generally requires water to bring the fruit up to size. It acts as a connecting link between the first early and second early varieties.

Aunt Becky and Carman, which belong to the second early group of peaches, are successfully grown in this region.

It is generally unwise to attempt to grow the mid-season or later varieties of peaches in this strip of the coastal district.

Japanese Plums.—Shiro, Santa Rosa, Chalco, Wickson, and Japanese Sultan do well, and can be grown in this region, even without artificial watering, though, of course, watering when necessary removes one of the elements of risk.

Region B (The "Inland" Coastal Area).

This region is situated to the west of the mild winter coastal region "A," but east of the Dividing Range, and there the winter frosts are more severe and the atmosphere dryer. It includes such localities as Glenfield, Liverpool, Camden, Penrith, and Richmond.

Peaches.—The first early varieties of peaches are not suitable on account of the severity of the winter frosts experienced, and second early and mid-season peaches should be planted. On the deep light soils in these parts, such varieties as Greensboro, Aunt Becky, Carman and Blackburn are successfully grown in normal seasons without artificial watering, but, of course, where water is available success is more assured.

Where irrigation water is available in Region B, Le Vainquer, a variety of peach that may be classed amongst the first early but does not blossom so early as many of this class, and Braddocks can be grown, though without water the fruit of these two varieties would fail to develop sufficient size in many seasons.

Japanese Plums.—The varieties mentioned for Region A can also be grown in Region B.

Region C.

This region consists of the slopes or foothills east of the Dividing Range and the higher rainfall parts of the wheat belt. The following varieties are recommended:—

Peaches.—High's Early Canada, Zerbes Early, Aunt Becky, Carman, Ruby Red, Blackburn, Dripstone Elberta, J. H. Hale, Shanghai Seedling Cling.

With watering Le Vainquer can be grown, giving a peach ripening six or seven days before High's Early Canada. Irrewarra and Goldmine are suitable varieties of nectarines.

The fruit of peach varieties maturing much later than Elberta, especially the late clingstones, too often fail to size up satisfactorily, and should not be planted in this region unless some water can be provided to augment the rainfall during dry spells.

Plums.—Giant, Grand Duke, Angelina Burdette, Ponds, and President.

Japanese Plums.—Santa Rosa, Wickson, and Narrabeen.

Apricots.—Ouillin's Early Peach, Trevatt and Mansfield.

Cherries.—Localities suitable for cherries are more limited than for many other kinds of deciduous fruits, but where the right conditions can be found in this region the following varieties are suitable:—Early Lyons, Eagles Seedling, Florence, St. Margaret. A limited number of Early Purple Guigne worked on Mahaleb or Kentish stock should be included to pollinate Early Lyons, and Bigarreau Napoleon should be included to pollinate St. Margaret and Florence.

Apples.—Undoubtedly Granny Smith is the variety most suited to this region, but for the sake of inter-pollination Red Delicious or Lalla and Jonathan should also be planted. In some parts of Region C, Jonathan is

liable to run too small, but it is difficult to eliminate it and leave a second pollinator for Granny Smith. Red Rome Beauty also grows successfully in many parts of this region.

Pears.—The milder climate of this region produces a smoother skinned and more attractive pear than many of our tableland districts. Moreover, the pear tree is more resistant to drought than other kinds of deciduous fruits commonly grown. The following are suitable varieties:—Williams, Beurre Bosc, Packham's Triumph, and Josephine de Malines.

It should be remembered that within this region droughts are liable to occur, when the fruit will fail to mature properly and some of the older and weaker trees will die out, especially amongst the stone fruits. Hence, some system of auxiliary irrigation is most advantageous. Unfortunately, in many places this is not practicable.

Region D (Murrumbidgee Irrigation Area).

To carry on fruit growing successfully in the lower rainfall parts of the wheat belt, or in the still dryer country further west, provision must be made for irrigation. When selecting a site for an orchard under these conditions it is not only necessary that the soil be suitable for the trees to be planted, but also suitable for a full irrigation practice. Auxiliary or partial irrigation may be carried out on land that would soon show serious defects if a full irrigation were practised.

The largest area of fruit in New South Wales under full irrigation is on the Murrumbidgee Irrigation Area. Besides citrus and vine fruits, peaches, apricots and prunes are grown.

Peaches.—Except for Elberta, peach growing is practically confined to clingstones for canning. In an endeavour to extend the season of canning peaches, both the Department of Agriculture and the Water Conservation and Irrigation Commission have introduced several varieties of peaches with a canning reputation from other countries. Unfortunately, most of these varieties, when grown under our conditions, have faults either from the grower's or the canner's point of view. Consequently, the largest proportion of canning peaches grown in this State consist of Pullar's Cling and Golden Queen, and the former predominates. Pullar's Cling is a strong-growing hardy tree, crops heavily and regularly (last season was the first time it failed since it has been grown extensively in New South Wales), and it is not difficult to keep the fruit up to size. The fruit, however, has one fault as a canner—the flesh has a red colour next to the stone. This is not entirely removed when pitted. This red area, after processing, shows as a brown patch. The consumer is suspicious of this brown patch, quite wrongly thinking it may be decay, and sales are thereby adversely affected to some extent on our home market, but much more so on oversea markets, where our canned peaches meet with competition from other countries. There cannot be any great extension of our area of canning peaches unless our export of canned peaches is not only maintained, but increased.

Pullar's Cling is often termed "a good grower's peach," but growers should remember that if the canned product from it fails to sell, it will be a very poor grower's peach. Hence growers who contemplate planting canning peaches should be wary of planting a large area of Pullar's Cling, and should concentrate more on Golden Queen, and should also take care that they only plant locations that are absolutely suitable for the production of canning peaches under irrigation.

Two or three growers on the Murrumbidgee Irrigation Area are growing what is locally known as the "Burn's Phillips' Cling." This peach appears to be cropping satisfactorily with these growers and supplies a canning peach maturing before the Golden Queen period, which is desirable, but growers contemplating planting this variety should be most careful to obtain the correct type, as there are types of Phillip's Cling which are very erratic croppers. A variety called Peak, which was selected by Mr. J. Brady, manager of the Leeton Cannery, during a visit to the United States of America, is worthy of mention. Its excellent canning quality has been maintained when grown at Leeton, but it has not yet been definitely proved whether its cropping will be satisfactory. This would be more quickly ascertained if every grower who intended planting canning peaches on the Irrigation Area would include a few of the Peak variety.

Apricots.—Trevatt has proved the most reliable cropper amongst the apricots. It is a particularly strong-growing tree, but the quality of the fruit is only fair; however, up to the present nothing more suitable to the Murrumbidgee Irrigation Area has been found.

Prunes.—Both Robe de Sergeant and Prune d'Agen are successfully grown for drying. These two varieties should be planted in alternate pairs of rows, and it is better still to have a limited number of Angelina Burdette plums trees interspersed regularly through the rows to provide efficient cross-pollination.

At the present time it would be decidedly unwise to extend the area under prunes.

Apples have been grown to a limited extent, and Granny Smith stands out as the most satisfactory variety. Jonathan and Delicious, which are generally depended on to pollinate Granny Smith in our tableland districts, are not suitable varieties for the hot districts. After Granny Smith, King David is the most satisfactory variety to grow on the Murrumbidgee Irrigation Area, and this variety must be depended on to pollinate Granny Smith.

Pears.—Williams pears, though grown to a small extent, have proved rather disappointing, the fruit not attaining that even outline that it was reasonable to expect under the conditions on the Murrumbidgee Irrigation Area.

Region E (The Tablelands).

The danger of spring frosts is one of the chief limiting factors to fruit-growing on our tablelands, and for this reason some of the southern table-

land of the State must be excluded, but elsewhere sites can be found where the spring frost risk is not too great and where soil and other conditions are suitable. Apples and pears are the main fruits grown.

Apples.—The chief apple varieties are Granny Smith, Democrat, Red Delicious or Lalla, Jonathan, and Red Rome Beauty. Rome Beauty has not proved very satisfactory on parts of our northern tableland.

Pears.—The varieties mentioned for Region C can be planted.

Cherries.—The cherry is a most exacting tree, and should never be planted except in suitable sites and soil. Heavy clay subsoils must be avoided. Early Lyons, Eagles Seedling, Florence, St. Margaret, and Noble are the main varieties. Bigarreau Napeoleon should be included for pollinating St. Margaret, Noble, and Florence.

Plums.—Suitable varieties are Ponds, Angelina Burdette, Grand Duke, President. It is on the tablelands that our best President plums are produced.

Peaches.—Owing to their early blossoming habit, the greatest care must be exercised when selecting a site for peach trees on the tablelands, but where this has been done peaches of the highest quality are produced in some parts. The second early and mid-season dessert varieties, such as High's Early Canada, Zerbes Early, Carman, Wiggins, Ruby Red, Blackburn, and Elberta are the most satisfactory.

Ploughing.

It is well to remind growers that the ploughing in of green crops, either sown or weeds, should be completed by the end of July. The necessity for this, and the advantages of early ploughing where the land has become compacted since the autumn ploughing or where an autumn ploughing has not been carried out, were explained in last month's Orchard Notes.

Pests and Diseases.

Peach Leaf Curl.—The control of this disease was dealt with in last month's Notes, but it is desired to remind peach growers that July is a good time to apply the sprays for peach leaf curl to peach varieties that blossom in August and early September. If black aphids are showing on any of the trees, nicotine sulphate (40 per cent.) can be added to either the lime-sulphur or Bordeaux mixture used, using the 40 per cent. nicotine sulphate at the rate of 1 to 600 (*i.e.*, 1 pint to 75 gallons). If, however, green peach aphids are also showing on the trees, the treatment for this pest, given below, will, of course, kill any black peach aphids present on the trees.

Green Peach Aphid.—One of two treatments can be used for this pest. Tar distillate diluted at the rate of 1 to 35 of water by volume can be applied whilst the trees are quite dormant, but after the last of the overwintering eggs have been laid; this generally occurs from about the last week in June to mid-July in our inland parts. The object of the tar

distillate spray is to kill the overwintering eggs and thus prevent an outbreak of this pest. The tar distillate spray should not, on any account, be applied to peach trees after the buds are well swollen.

If a grower has been unable to carry out the above treatment he still has another string to his bow, for he can spray after the overwintering eggs have been hatched, but before the buds burst, with nicotine sulphate (40 per cent.), at the rate of 1 to 600 of water by volume, plus 1 lb. soft soap to 25 gallons of the spray. The nicotine sulphate and soap spray will not kill the overwintering eggs, so that it is of no use applying this spray till the eggs have hatched, but it must be applied before the buds burst, otherwise the opening buds make too much cover for the young aphids and the spray will not reach them.

Black Cherry Aphid.—Growers should keep a lookout for the eggs of this aphid on their cherry trees, and should they find them should spray with tar distillate at the rate of 1 to 35 of water by volume when the trees are dormant, or with miscible spray oil at the strength of 1 to 20 of water by volume, when the buds are well swollen.

San José Scale.—It is during pruning that this pest is often detected. Where it is present the trees should be sprayed with miscible spray oil diluted 1 to 20 of water by volume.

Woolly Aphid.—Generally, since the introduction of the parasite *Aphelinus mali*, this pest has given very little trouble, but there are instances this year where the woolly aphid has made headway on apple trees during the latter part of the fruit season. This may be due in part to the extensive use of contact insecticides in the spring for thrips weakening the parasite. In any case, it would seem advisable to clean up the apple trees badly affected whilst they are dormant. Tobacco wash or nicotine sulphate could be used. As it takes a heavy dose of spray to clean up trees heavily infested, and as much of the spray accumulates at the base of the tree, it is better to avoid the use of oil for this purpose.

From investigations carried out by the Entomological Branch, it is evident that contact insecticides such as those just mentioned, applied during the winter, do not injure the parasite *Aphelinus mali* to any extent, as at this period it exists mostly in the egg or larval stage inside the bodies of the aphis.

Planting.

With the exception of some of the very early blossoming peaches, planting of deciduous fruit trees can be continued this month, provided the land is in good condition. However, the advantages of earlier planting have been pointed out in previous Notes.

Leaflets on Peach Leaf Curl, Black Peach Aphid, Green Peach Aphid, Woolly Aphid, San José Scale, and Laying-out and Planting are obtainable free on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Fumigation of Incubators.

Using Formalin and Potassium Permanganate.

W. J. B. MURPHY, B.V.Sc., H.D.A., Government Veterinary Officer.

Success in poultry farming is dependent, to a large extent, upon the successful hatching and rearing of young stock. Chickens are subject to a number of diseases, among which are those known as bacillary white diarrhoea and navel infection.

Bacillary White Diarrhoea.

Bacillary white diarrhoea is caused by a specific germ, which is passed from the "carrier" hen through the egg to the resulting chicken, where it causes a highly infectious and fatal disease. Such a chicken on hatching is heavily contaminated with the causal germ of bacillary white diarrhoea, and as it dries out in the incubator vast numbers of these germs attached to small pieces of "down," dust particles, &c., are given off into the atmosphere enclosed within the hatching compartment. Contact between such an infected chicken and the fittings within the incubator completes the generalised contamination of the whole of the interior of the machine. It is chiefly by the circulation of infected material in the atmosphere of the incubator while hatching is in progress that the disease is spread from a small number of chickens to the remainder of the hatch. What is more important is the fact that this germ will survive and cause the reappearance of the disease in future hatches.

Navel Infection.

Navel infection is a disease which commonly has its origin in incubators. Unlike bacillary white diarrhoea, its cause is not a specific germ, as a number of germs may be responsible for this condition. The navel, or umbilicus, of newly-hatched chickens may not be completely closed, and through this small opening germs may gain access to the yolk sac with which it communicates. In this location pus formation occurs with the liberation of toxins resulting in a disease often characterised by heavy mortality, and clinically not unlike bacillary white diarrhoea.

The germs responsible for the above two conditions, when present in an incubator, may cause heavy and continued losses unless some control measures are adopted. Formaldehyde gas ("formalin gas") is highly toxic to the lower forms of life, such as germs. Liberated by the action of potassium permanganate (Condys crystals) upon liquid formalin, it is used for the purpose of fumigating incubators with satisfactory results. Its efficiency for this purpose has been confirmed by tests carried out at Glenfield Veterinary Research Station.

When to Fumigate.

The higher the humidity or moisture content of the air within the incubator, the more effective and penetrating will be the toxic properties of the formaldehyde gas towards germ life. This makes it imperative that fumigation should only be carried out when the incubator is actually running and the eggs have been in it for at least twenty-four hours if the full benefits are to be obtained. It can be definitely stated that the process of fumigation will in no wise affect the normal development and hatching of the chickens, and, further, when the eggs are subjected to the process, any germs which may be adhering to the shells will be destroyed.

Fumigation should be made a routine procedure on all poultry farms, as it is an inexpensive preventive measure against disease. During the course of their incubation period each batch of eggs should be subjected to three fumigations. In an incubator that is completely filled with eggs, which are allowed to hatch without the further addition of eggs during the incubation period, fumigation should be carried out on the second, tenth, and eighteenth day of incubation. In certain types of incubators eggs are placed in the machine at regular intervals of three days, and in such cases it should be so arranged that fumigation will take place once each week, timing it so that each batch of eggs is fumigated at least three times before hatching. In another type of incubator the eggs are removed on the eighteenth day to a special detached hatching chamber. In this case fumigation should be so arranged that each batch of eggs receives two fumigations before being removed to the hatching chamber, and in the latter location the third and most important fumigation is given shortly after the eggs are placed therein. Under no circumstances should the fumigation of the hatching compartment be neglected. Even though some eggs may have "chipped" there need be no fear, as the formaldehyde gas, toxic as it is to germ life, is relatively harmless to higher forms of animal life.

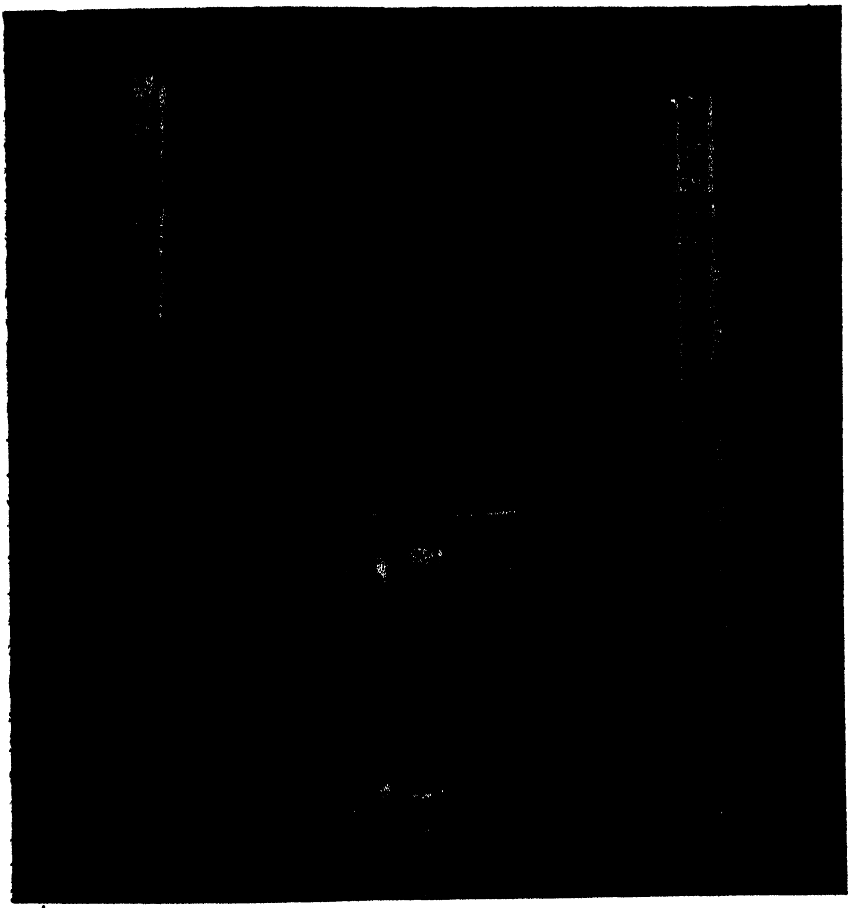
Equipment Necessary for Fumigation.

A supply of 40 per cent. formalin and potassium permanganate, two 10 c.c. graduated glass cylinders, one small beaker, and a number of china egg cups or larger earthenware pots, depending upon the size of the incubator to be fumigated, are all that are required to carry out fumigation (see Fig. 1). Egg cups are suitable when the space to be fumigated is less than 10 cubic feet.

Owing to the fact that when formalin and potassium permanganate are brought together, vigorous effervescence, with the generation of heat and the liberation of formaldehyde gas occurs, a sufficiently large and strong earthenware or china vessel should be used to avoid overflowing of the materials and cracking of the container due to the heat. Do not use a flat vessel such as a saucer, as some of the formalin will tend to run to one side, and, therefore, complete interaction of the two substances will not take place. Metal containers must not be used.

Quantities to Use.

The amounts of formalin and potassium permanganate for use in fumigation have been carefully worked out so that just sufficient formaldehyde gas will be liberated to destroy germs without affecting the development of the eggs, and in all calculations the figures given below should be strictly adhered to.



Two 10 c.c. Graduated Glass Cylinders and a 50 c.c. Beaker.
The cylinders cost about 1s. 9d. each and the beaker 8d.

First, it is necessary to calculate in cubic feet the cubic capacity of the incubator by multiplying together the three dimensions (inside measurements). No allowance is made for space taken up by inside fittings, eggs, &c. In the smaller still-air cabinet types of incubators, for each cubic foot of space the following amounts of fumigating materials are required:—0.35 cubic centimeters of 40 per cent. formalin and 0.175 grams of potassium

permanganate. In the larger forced draught incubators these amounts are increased as follows:—0.4 cubic centimeters 40 per cent. formalin, 0.2 grams potassium permanganate per cubic foot of space to be fumigated.

Example.—Take an incubator with the following dimensions:—Length 4 feet, width 3 feet, depth 1 foot 3 inches.

Cubic capacity—4 ft. x 3 ft. x 1 ft. 3 in.=15 cubic ft.

The amounts of material to use are arrived at as follows:—

15 x 0.35=5.25 c.c. 40 per cent. formalin.

15 x 0.175=2.625 grams potassium permanganate.

Formalin, being a liquid, is measured in one of the glass cylinders, which is graduated to 0.1 of a c.c. The potassium permanganate, however, must be weighed. When the exact amount required has been calculated, ask your chemist to weigh out this quantity accurately. Before using it, transfer it to one of the glass cylinders and carefully note and record the height to which this amount reaches on the graduations. As the same amount will be required on all future occasions, this second glass cylinder (which must be kept dry) will serve as a means of arriving at a reasonably accurate estimation of the required weight.

How to Fumigate.

It must be recognised that no system of fumigation is capable of penetrating and disinfecting large masses of droppings, &c., and it is necessary, therefore, at the commencement of the hatching season and between hatches to scrub and cleanse the inside of the incubator and its fittings thoroughly with a hot 3 per cent. solution of phenol. Any fabric used inside the incubator should also be either disinfected or boiled between hatches. These precautions are not, however, sufficient to control all germ life within the machine, particularly those germs of a pathogenic nature which may be disseminated in the air; hence the need for fumigation.

The calculated amount of potassium permanganate is placed in a clean vessel. A small quantity of formalin is poured first into the beaker and then the exact amount is measured from this into the glass cylinder. The beaker will be found necessary, as small amounts of fluid cannot be accurately poured from a bottle. The door of the incubator is then opened, the formalin added to the potassium permanganate, and the vessel containing both ingredients immediately placed on a previously adjusted ledge inside the incubator and the door closed. It is not necessary to block up the ventilation ports of the machine while fumigation is in progress. After fifteen minutes fumigation is complete, and the material may be removed. The incubator should be closed up again and allowed to run in the normal manner.

When taken from the incubator a slightly moist charry mass remains in the bottom of the vessel. If this is bone-dry a slight excess of potassium permanganate has been used, while if any appreciable amount of liquid is still present, too little potassium permanganate has been used.

Important Points.

In conclusion, the following points might be emphasised:—

Fumigation is safe and effective. Make it a routine practice.

Aim at giving the final fumigation on the eighteenth day of incubation.

Keep the formalin bottle tightly corked.

When fumigating have the humidity in the incubator high. This is essential for effective fumigation, and, further, when hatching is in progress a high humidity greatly decreases the amount of circulating germ-carrying dust particles.

A note of warning is necessary where an outbreak of bacillary white diarrhoea has occurred. While helpful, fumigation will not control this disease, and, further, germs contained in unhatched eggs will not be destroyed. Such eggs should be burned together with all egg shells from the incubator.

Finally, poultry farmers should pay attention to their incubator rooms. These should be maintained in a sanitary, dust-free, well-ventilated condition, and should be disinfected periodically. Sprinkling of the floor with water will tend to lessen the circulation of dust particles.

Contagious Abortion Certainly Does Exist in N.S.W.

For some reason which is difficult to understand, writes Mr. Max Henry, Chief Veterinary Surgeon of the Department, there appears to be a concerted attempt to persuade stockowners that contagious abortion does not exist in New South Wales. It will be regretted if this persistent attempt to mislead the stockowner is successful, because it will be likely to induce him to neglect to take precautions.

Contagious abortion exists in every dairying country. It is being scientifically investigated in most European countries, U.S.A., Canada, Australia, and elsewhere. The evidence that the bacillus abortus discovered by Bang is the cause of this disease is overwhelming. Unfortunately, the treatment of this disease to bring about a cure is very discouraging. Many drugs have been tried without avail, and this has led to the placing on the market of some useless nostrums.

Whilst contagious abortion leads to sterility, it must, however, be borne in mind that it is not the only cause of that condition. Many other factors may bring about sterility either of a temporary or permanent nature.

The attention of those interested in this subject is drawn to an article in last month's *Agricultural Gazette*, wherein is set out much of our present knowledge of the disease.

In view of the continued intensity of the mouse plague, a warning is issued as to the possibility of feed being used which contains the bodies of dead mice, as this might possibly result in forage poisoning.

Poultry Notes.

July.

E. HADLINGTON, Poultry Expert.

Rearing Chickens.

MORE troubles are encountered during the rearing of poultry, particularly during the brooding stage, than at any other period, and there is a prevailing disposition to attribute most of them to disease, without question as to whether the conditions in the brooder may have been primarily responsible. Every effect has a cause, and I would emphasise that the majority of chicken ailments are preventable. It is a well-known fact that in the case of human beings there are many disease germs which lurk in our midst awaiting an opportunity to gain a hold, and that anything which lowers our resistance renders us an easy prey to such organisms. The same applies to poultry, and not until this is generally recognised will there be any material reduction in the enormous losses which annually occur in the rearing of chickens.

It is safe to say that the germs of such diseases as coccidiosis are present on most farms, and anything which occurs to lower the vitality of the chickens, such as chills, sweating, being crowded in a vitiated atmosphere, and so on, renders them susceptible to attack, and in this connection the happenings of some days previous to the time the trouble became evident have therefore to be considered. It may be that the heating apparatus of the brooder cooled down during one night, the chickens may have been left out in the cold wind, or the brooders were overcrowded. These, and many other happenings, were perhaps not regarded seriously when they occurred, and so were forgotten by the time the chickens commenced to die; but it is only by giving consideration to such possibilities that many of the troubles will be accounted for. The question as to whether there may be constitutional weakness due to unsound breeding stock, or whether faulty feeding was responsible, must also be taken into account.

Factors in Brooding.

It can be safely said that a large proportion of chicken troubles are directly traceable to faults in brooding, and in this regard there are certain fundamental principles which are vital to successful rearing, and yet so simple that many fail to grasp their importance. Any heated brooding system must be capable of generating sufficient heat in the coldest weather to prevent the chickens packing together; at the same time ample ventilation must be allowed to ensure pure air. Provision should be made to allow the chickens to move away from the heat zone to a cooler atmosphere if the temperature becomes too high. With such a means of escape from the heat there need be no worry because the temperature is a few degrees higher than that stipulated. Any brooder which necessitates the chickens being

shut in to retain sufficient heat is unsatisfactory, and is sure to lead to trouble sooner or later. Another important factor is that the inside runs should be large enough to avoid congestion when the chickens have to be kept in during wet or otherwise unfavourable weather.

The brooding equipment on a farm is the most important section, because unless the chickens are properly reared they will not grow into birds of strong physique, which is essential to high production, and they will lack resistance to disease. Intending poultry farmers should, therefore, concentrate on this part of the farm and provide good equipment, even if it necessitates makeshift arrangements in other sections. It is deplorable to see the wastage of chicken life annually taking place, much of which could be avoided if the significance of these few precautionary measures were fully appreciated and acted upon. The result would be a lessening of worry in the rearing of chickens and a greater measure of profit to the poultry farmer.

Operating the Brooders.

In commencing the season it is advisable to start up the brooder well before the chickens are due, so that it can be ascertained if everything is working satisfactorily before they are put in. The temperature should be standing steadily at about 90 deg. Fahr. When the chickens are put in it may be allowed to rise to 95 deg. or even a little higher, after which the temperatures for chickens of various ages should be as follows:—

First week	95 to 90 deg. Fahr.
Second week	90 to 86 " "
Third week	86 to 82 " "
Fourth week	82 to 78 " "
Fifth week	78 to 74 " "
Sixth week	wean off heat.

If possible, it is advisable in the cold weather to keep the chickens in the brooders a week longer. Working to these temperatures has been found by practical experience over many years to give the best results. Not only should the temperature stated be maintained at night time, but it is as essential that the heat be kept up in the day time.

Stoke Up Early.

Where coke-heated brooders are used a practice should be made of stoking up the brooder heater at least an hour before the chickens are due to go up for the night, so that the brooders will be thoroughly warm for them to go into. Any cooling off at that time will result in the chickens huddling to get warm, and if this continues for half an hour or so sweating will often result. Even though the temperature is kept up well, there is a tendency for the chickens to crowd when they first go up at night, and for this reason it is desirable that the attendant be on duty at that time so as to see the chickens comfortably settled down, and then regulate the temperature to the required level. Another inspection should be made midway between the

time the chickens go up and the final stoking for the night, for the purpose of regulating the temperature again.

Avoid Crowding.

A mistake that is often made, and which is the cause of many losses among chickens, is to fill all the brooders to their capacity with chicks just hatched, and thus leave no room for thinning out as they grow. It should be remembered that if a brooder is filled to its capacity at first, the numbers of chickens will require to be reduced to about half by the time they are ready to leave the brooders.

Feeding Experiments.

In 1924 a series of experiments was commenced at Hawkesbury Agricultural College, Richmond, with a view to determining the amount of meat meal it was most satisfactory and economical to feed to laying hens. These experiments were continued in 1925-26, 1926-27, and again in 1931-32, other work preventing the tests being carried on in the intervening years.

In order to ensure uniformity in all these experiments, as far as practicable birds which were bred on the same lines and as nearly as possible of the same age were selected, and placed in the pens a month before the eggs were recorded. During this time they were graded up so that to commence with each group was as even as possible as regards laying.

The ration fed consisted of wet mash in the morning and grain for the evening feed in the following proportions:—

Morning Mash.

Lot 1.—Pollard, 66⅔ per cent.; bran, 33⅓ per cent.; meat meal, nil.
Lot 2.—Pollard, 65 per cent.; bran, 32½ per cent.; meat meal, 2½ per cent.
Lot 3.—Pollard, 63⅓ per cent.; bran, 31⅔ per cent.; meat meal, 5 per cent.
Lot 4.—Pollard, 61⅔ per cent.; bran, 30⅚ per cent.; meat meal, 7½ per cent.

Common salt was used in the mash at the rate of 22 oz. per 100 lb.

Evening Feed.

Two-thirds wheat and one-third maize.

The first experiment, commenced in 1924, was carried out over the flush season of production, September to March, and the results were as tabulated below:—

THE 1924-25 TEST.

—	Meat Meal.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Average per Hen.
	per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1 ...	Nil.	786	718	693	624	567	269	86	3,643	91
Lot 2 ...	2½	761	764	637	615	492	271	146	3,686	92
Lot 3 ...	5	784	816	704	716	600	399	246	4,265	106·6
Lot 4 ...	7½	744	795	661	674	584	401	286	4,145	103·6

Each lot consisted of two pens of twenty birds.

The following year, 1925-26, a further test was carried out over the whole twelve months, commencing in May and concluding in April. The rations fed were the same as in the previous one, and the number of birds was also identical. Particulars of the laying are given hereunder:—

THE 1925-26 TEST.

—	Meat meal.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total.	Average per hen.
	Per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1 ...	Nil.	101	116	396	547	629	629	467	526	431	311	200	10	4,363	109
Lot 2 ...	2½	145	263	399	669	650	718	669	584	578	345	308	101	5,429	135
Lot 3 ...	5	[illegible]1	257	396	694	685	693	554	567	395	291	256	93	5,112	127
Lot 4 ...	7½	257	329	509	761	774	727	606	616	544	346	318	100	5,882	147

Each lot consisted of two pens of twenty birds.

In 1926-27 the no-meat-meal group was omitted, and three pens of twenty birds each were used in the 2½ per cent. group, two pens of twenty birds in the 5 per cent., and three pens of twenty birds in the 7½ per cent. lot. There were not sufficient pens available to permit of three pens of each.

The test was carried out over the twelve months, June to May, but owing to some of the pens being required, only one pen of each was carried on during the last two months; therefore, in order to avoid any lack of uniformity, the results are given covering the ten months only from June to March.

The rations fed were in the same proportions as in the first and second tests.

THE 1926-27 TEST (TEN MONTHS).

—	Meat meal.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Average per hen.
	per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs	eggs.	eggs.	eggs.	eggs.
Lot 1—60 pullets	2½	621	772	1,037	1,211	1,126	1,035	959	613	410	250	8,034	133·9
Lot 2—40 pullets	5	357	504	669	800	773	708	652	453	320	195	5,431	135·7
Lot 3—60 pullets	7½	596	810	1,052	1,178	1,191	1,115	1,010	639	568	413	8,572	142·8

Last year further work was undertaken with three groups of birds made up of three pens of ten birds each, and the same basic ration was given, but the quantity of meat meal was varied by using 5 per cent., 7½ per cent., and 10 per cent. for the respective groups. The results were as follows:—

THE 1931-32 TEST.

—	Meat meal.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total.	Average per hen.
	per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	egg.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1 ...	5	350	368	513	585	609	606	545	532	285	319	278	167	5,157	172
Lot 2 ...	7½	386	435	507	554	588	591	511	506	383	421	330	230	5,442	181
Lot 3 ...	10	483	503	562	629	61[illegible]	622	568	508	441	452	375	280	5,994	200

Each lot consisted of three pens of ten birds.

ANALYSIS of 1931-32 Test, showing Eggs per Pen.

Month.	5 per cent. meat meal.			7½ per cent. meat meal.			10 per cent. meat meal.		
	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
May	127	85	138	150	104	132	158	148	182
June	111	112	145	158	132	145	177	171	157
July	172	170	171	170	140	197	190	192	180
August ...	197	193	195	196	161	197	223	216	190
September ...	221	190	198	219	175	194	205	213	196
October ...	210	196	200	195	183	213	198	223	201
November ...	188	196	161	160	147	204	174	208	186
December ...	174	211	147	173	144	189	171	172	165
January ...	83	119	83	155	112	116	124	166	151
February ...	108	143	68	181	96	144	130	167	155
March	93	87	98	128	83	119	98	166	111
April	47	60	60	88	54	88	54	106	70
Totals ...	1,731	1,762	1,664	1,974	1,531	1,938	1,962	2,148	1,944

Comments on the Results.

It will be noted that in the first experiment in 1924-25 the average egg production was practically the same for the group not receiving meat meal and those being fed 2½ per cent., while the birds which were given 5 per cent. laid an average of three eggs more than those receiving 7½ per cent. In the 1925-26 test the hens in the 7½ per cent. group laid the greatest number of eggs, yet those receiving 2½ per cent. laid an average of ten eggs more than the 5 per cent. pens. The following year the results showed a gradual increase in production in proportion to the amount of meat meal fed.

The experiment just concluded also shows a gradual increase in production in the different groups in accordance with the percentage of meat meal fed, but when the yields from the pens comprising each group are examined there are certain contradictory features. For instance, while the production from the three pens receiving 5 per cent. meat meal was fairly even, the figures for the three pens fed 7½ per cent. show that while the production of two of the pens was about even, the number of eggs laid by the third was considerably lower. On the other hand, while two of the pens in the 10 per cent. group also laid a similar number of eggs, the third pen gave a much higher production. Thus if the two even pens of the 7½ per cent. and 10 per cent. groups were compared the result would be in favour of the 7½ per cent. group. Such experimental error is often met with, making it difficult to arrive at any definite conclusion without extensive trials. In view of this, a further experiment is being carried out during the current year, and the results of this further test should be awaited before coming to any decision in the matter.

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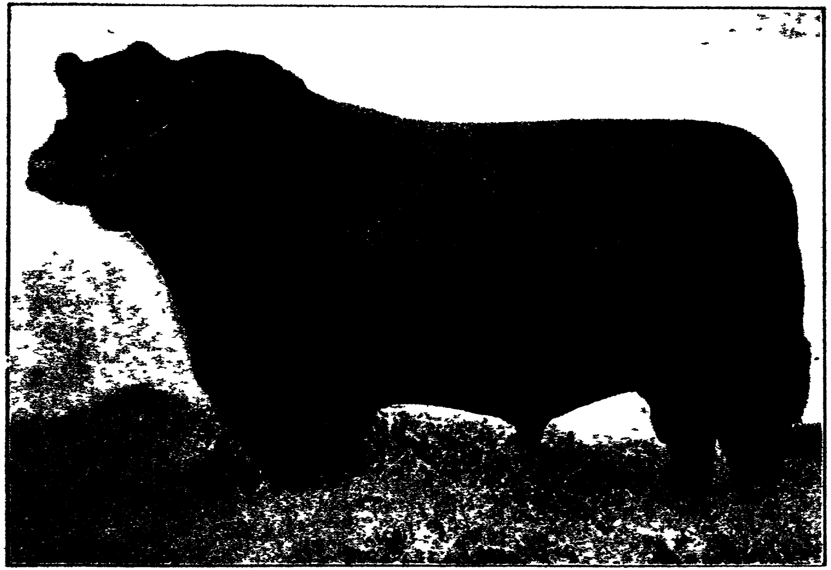


GLENCARNOCK REVOLUTION (imp. CANADA) (31939).

[Stationed at Trangie Experiment Farm.]

The "Trangie" Aberdeen-Angus Stud is founded on the world-famous "BLACKCAP REVOLUTION" (27530-C.A.A. Soc.), blood of "GLENCARNOCK" (Canada).

Full particulars from—

THE UNDER SECRETARY, DEPARTMENT OF AGRICULTURE,
Box 36a, G.P.O., SYDNEY,

Agricultural Gazette of New South Wales.

Sheep Shearing.

THE OPERATION DESCRIBED STEP BY STEP.

E. A. ELLIOTT, Sheep and Wool Expert.*

SHEEP shears, or "blades," were in general use until about 1890, though Wolseley originated his first shearing machine in 1869. It was not a success, and his second effort in 1877 was also far from successful. In 1887, however, he put on the market the machine which revolutionised the shearing industry. The machine of the present day is based on the machine evolved by Wolseley in 1887.

Blades, however, are still used in many countries, and even in Australia a number of owners have their sheep shorn with blades. In fact, most stud breeders shear their best stud sheep, both rams and ewes, with the blades, as they are not shorn so close to the skin.

When shearing with blades, although the sheep is held in the same positions as when using the machine, there is no need for the same degree of exactness as is necessary with the machine, which has only a certain length or extension from the shafting above. For this reason the recognised positions of holding the sheep must be learnt carefully and rigidly adhered to, or the shearer will find difficulty in carrying out his work.

First Position.

The sheep is caught under the neck and carried out of the catching pen, the shearer walking backwards to his stand. The animal is then placed in a sitting position in front of the shearer, who faces the shearing board, with his machine on his right side and slightly behind him.

* The blocks to illustrate this article were loaned by the Lister Sheep Shearing Machinery Agency, Sydney.

Second Position.

The shearer commences by removing the belly wool. Holding the sheep's shoulders between his knees, the shearer cleans the brisket and then runs the machine down the right side from the brisket to the flank. The belly wool (bellies) is then removed in one piece, finishing on the left side, every care being taken not to injure the pizzle of male sheep or the teats of ewes. The bellies are torn off and dropped on the floor, being picked up and put in a bin or on a table for treatment by one of the floor boys.

Third Position.

Allowing the sheep to drop back slightly, though still gripped with the legs of the shearer, the crutch and inside the hind legs are shorn.

Fourth Position.

Rolling the sheep over on its right side, the head and shoulders leaning against the shearer's legs, the outside of the animal's left hind leg and hip are easily shorn, going well into the flank and over the tail.

Fifth Position.

Sitting the sheep up once more, the shearer places his right leg between the hind legs of the sheep, tucking the right foreleg behind his right knee. With a couple of short blows with the machine, he first shears the face and topnot, and then gripping the sheep by the jaw and nose he opens up the neck wool, starting in at the brisket and coming out near the right ear of the sheep, taking care to keep the machine flat and close to the skin. He next shears under the neck and round past the left ear over the back of the head and then works down towards the left shoulder.

Sixth Position.

He next shears the left shoulder. With his left elbow he holds the head of the sheep back, and by pressing on the shoulder blade stiffens the leg to remove the wool from its lower portion. He then holds the foot in his left hand and works back over the shoulder.

Seventh Position (the Long Blow).

The sheep is then laid full length on its right side the head being held round the right leg of the shearer. The four legs of the sheep are bunched together, causing the back to arch, thus tightening the skin. After clearing between the shoulder and flank, the shearer works from the flank parallel with the backbone. Here again the machine must be kept flat on the skin or bad shearing will result. The right leg of the shearer should be kept almost straight. Any attempt to press the knee in the flank of the sheep should be prevented, as injury of the sheep may result.

Eighth Position.

The shearer now steps back, slightly lifting the sheep up and putting his right leg across the hind-quarters of the sheep. Holding the sheep by the jaw and then the neck, stretching the skin and pressing backwards, he shears from the right ear down the neck and over the right shoulder. The shearer should be careful when moving his right leg that he does not step on the fleece, for if this is done the fleece will be torn badly.

Ninth Position.

The shearer now grasps the right foot in his left hand and pulling it up is able to trim this leg, following down the line of the body.

Tenth Position.

The shearer now puts his feet closer together, and pulling the sheep up in front of his legs he is able to work with horizontal blows round the side till he reaches the flank.

Eleventh Position.

Stepping back slightly the shearer allows the sheep to lie well back on its left side. By pressing in the flank with the left hand the leg is extended, and while in this position the remainder of the fleece is removed. The fleece drops clear of the sheep and is ready to be picked up and thrown on the wool rolling table.

To the Counting-out Pen.

The shorn sheep is then gently pushed down the chute into the counting-out pen.

The Rabbit Again Presents a Serious Problem.

Inspectors of stock in many districts, particularly in the west, emphasise the serious situation that is rapidly developing in regard to rabbit infestation. Although the last drought reduced the rabbits to a minimum, the good feed which was available of late has encouraged breeding to such an extent that on some unnetted holdings on which rabbit destruction has not been pressed there are indications of a rabbit drought. Should the coming spring be in any way dry, the feed situation, as a result of the increase in rabbits, is likely to be serious. There appears to be need for very definite action on the part of all concerned. The reports of stock inspectors for the last few months have indicated that in a majority of districts rabbits are definitely increasing. The low prices for skins and carcases have to some extent has been responsible for this, as has also the difficulty of finance in connection with wire-netting purchases. A serious increase in rabbits must have a tendency to bring about malnutrition and the diseases associated with malnutrition in the live stock of the country.

Even on parts of the North Coast rabbits are drawing the attention of the local authorities to their increase and spread. In those areas where the rabbit is not yet numerous the pest should be dealt with with a firm hand, otherwise the expenditure on wire-netting will some day be very heavy.

The Department Watches Sheepowners' Interests.

As shearing progresses throughout the State, action will be taken by the inspectors of stock to visit as many sheds as possible with a view to determining the presence or absence of lice and tick among the sheep. Owing to the more favourable conditions existing this year, dipping should be practicable almost everywhere.

Inspectors of stock are also being instructed to keep a sharp lookout for lice-infested sheep in saleyards during the coming season.

Some Wrong Impressions Regarding Hydatid in Man.

The question of the association of hydatid in man with livestock has been raised lately and some erroneous statements have been published. Hydatid in man, writes the Chief Veterinary Surgeon of the Department, follows the swallowing of the eggs of the particular tapeworm of the dog. There appears to be an idea prevalent that hydatid may be contracted by man through eating rabbits, but this is quite erroneous. Even if hydatid cysts from an animal are swallowed by man they cannot do any harm, as it is only through the tapeworm egg that he becomes infected. Care should be taken to wash the hands after handling dogs before a meal is partaken of, as this is probably one of the commonest methods of infection. Care should also be taken not to feed the livers or lungs of sheep and cattle which have hydatids in them to any dogs, as it is by that action that the dog is attacked by tapeworm. Dogs do not, contrary to the statements published in some places, suffer from the hydatid stage of the disease, but merely harbour the tapeworm itself.

It is understood that the impression has been created that the Department of Agriculture proposes to require that all dogs should be treated, but this is quite erroneous.

Jetting for the Reduction of Sheep Blowfly Attack.

THE VALUE OF CERTAIN INSOLUBLE ARSENICALS AND OTHER MIXTURES.

R. N. McCULLOCH, B.Sc., B.Sc.Agr., Assistant Entomologist.

DURING 1930–32 field trials of new jetting mixtures, some in comparison with two commonly in use, were carried out. The investigations which led up to the preparation of these mixtures were initiated in 1926 by Mr. W. B. Gurney, Entomologist of the Department of Agriculture following his theory that a jetting mixture should be found more lasting than arsenite of soda and merely strong enough to destroy the first stage (young) maggots and protect sheep from strike, irrespective of the number of eggs deposited. In January, 1927, Mr. K. C. Richardson, loaned by the Council for Scientific and Industrial Research, began research under Mr. Gurney's direction on the toxicity to blowfly larvæ of drugs likely to be of use. In his report, dated January, 1928, Mr. Richardson compared as contact larvicides, *i.e.*, those which kill merely by touching the insects, 160 substances, and dealt with the stomach poison properties, *i.e.*, their power to kill when eaten by the maggots, of some sixty chemical compounds. He also stressed the importance of including a wetting agent in any watery mixture intended for application to sheeps' wool. In dealing with stomach poisons he drew attention to the apparently equally high toxicity of some thirty inorganic salts, including those of arsenic (soluble and insoluble), copper, barium, boron, lead, fluoric acid, &c., but did not differentiate further between them.

The present writer, under the supervision of the Entomologist, took up the work in January, 1930, the plan of research being:—

1.—The discovery of the relative toxicity, as stomach poisons, of drugs likely to prove useful ingredients of jetting mixtures and dressings;

2.—The investigation of mixtures capable of wetting readily sheeps' wool;

3.—The production, from the information obtained, of new mixtures, and the organisation of field trials to test them.

Preliminary Experiments During 1930–1931.

Experiments in the laboratory and field tests on a small scale during 1930–31 indicated:—

1.—That among the more promising stomach poisons were fluorides, and the arsenicals arsenite of soda, Paris green and calcium arsenite. The fluorides, however, were apparently less rapid in their action than the arsenicals.

2.—That maggots on sheep could be killed out as rapidly by swabbing them with insoluble arsenicals, such as Paris green and lead arsenate, as when soluble compounds of the poison were used. This had been shown at "Walhallow" Station, Quirindi, in the autumn of 1930, and confirmed in the spring at Tondeburine, when a very encouragingly low percentage of re-strikes followed such treatment—under conditions, however, unfavourable to re-strike.

3.—That the addition of a wetting agent to aqueous jetting fluids increased their spread through the wool. Soap proved the best of wetting agents tried, but dilute caustic soda appeared a useful substitute. Resin soaps, casein compounds, &c., were not so satisfactory.

The Field Trials, 1932.

For field trials as many young ewes as could be handled were obtained in districts where the fly usually causes much trouble. At Trangie Experiment Farm the writer carried out or supervised the jetting, and then through the courtesy of the Manager (Mr. A. H. MacDougall) and the Sheep and Wool Expert of the Department (Mr. E. A. Elliott) it was arranged Mr. L. H. Beveridge should carry out the work of noting the strikes and the effect of the mixture on sheep and their wool. Mr. N. J. Taylor of "Tondeburine," Mr. W. A. Hunter of "Eureka," and Mr. G. F. Austin of "Warrimbone," all in the Gulargambone district, and Mr. R. Slack-Smith of "Drummard," Burren Junction, very kindly placed their flocks and considerable labour at the disposal of the Department. On these properties nearly 8,000 sheep were treated or used as controls.

In previous years the New Zealand and Australian Land Co., through the Manager, Mr. F. W. Croaker, allowed every facility at "Walhallow" Station, Quirindi, but as that district does not, as a rule, suffer from such severe blowfly activity as the ones mentioned above, the present experiments were confined to them.

To ensure that in any flocks the experimental groups were fair samples of the whole flock, the latter was first divided into two lots considered respectively susceptible or non-susceptible to fly attack. In making up the experimental groups, appropriate numbers were then taken from each of these lots. Subsequently, as the condition of the sheep required, they were yarded and the blown ones dressed. At each handling the number of blown sheep in each group was noted. No differentiation was made between new strikes and re-strikes, but the same dressing mixture and method of applying it was used throughout any particular flock for the time of the experiment. Owing to abnormally low blowfly activity, re-strikes were few.

At Trangie Experiment Farm the selection of susceptible sheep was done by Mr. E. A. Elliott and Mr. L. H. Beveridge (Sheep and Wool Instructor). At private stations this selection was done by the owners and the writer in conjunction.

In all experiments the sheep were jetted in long races, at ground level, the operator being in the race with the sheep. The writer jetted all the sheep at Trangie, "Tondeburine," and Burren Junction. At "Eureka" and "Warrimbone," where machines with two hoses were used, the owners shared the work with the writer. In all cases extreme care was taken to deliver the jet upwardly in the crutch, with the nozzle held within 2 to 3 inches of the fleece so as to "bubble" the liquid through the wool from the skin. For sheep which had been crutched a pressure of 150 to 170 lb. per square inch was used, and for sheep with full length wool a pressure of 180 to 200 lb. Soapy solutions and the calcium arsenite mixture were found to do almost exactly three uncrutched sheep per gallon. Rather less than two and a half sheep were jetted with each gallon of the sheep dip fluid in an effort to achieve perfect saturation.

The Mixtures Tested.

The mixtures applied were :—

1.—A proprietary arsenical powder dip. It was used at "Drummard" at the rate of one 12-lb. packet per 25 gallons of mixture, and at "Eureka" (experiments A and B) at the rate of one packet per 30 gallons.

2.—Arsenite of soda and soap, made by boiling white arsenic with three times its weight of washing soda, and adding 4 lb. soap per 100 gallons. At "Drummard," "Tondeburine," and "Warrimbone," 9 lb. of white arsenic per 100 gallons was used and at "Eureka" (experiments A and B), 10 lb. per 100 gallons.

These mixtures 1 and 2 have been used in jetting for a considerable number of years.

3.—Arsenite of soda and soap with kaolin added at the rate of 10 lb. per 100 gallons. Kaolin is a finely divided solid; it was thought that its application might lead to a more even, and a greater deposit of poison through the jetted fleece. In this mixture 9 lb. white arsenic was used at "Drummard," "Tondeburine," and "Warrimbone"; 10 lb. at "Eureka" (experiments B and D).

4.—A proprietary mixture of arsenic and soda containing 80 per cent. white arsenic. It was used at "Warrimbone" and "Eureka" (experiment B, C and D) at the rate of 8 lb. per 100 gallons with 4 lb. of soap added.

5.—Calcium arsenite with dilute caustic soda added as a wetting agent. It was made by boiling white arsenic, stone lime, and caustic soda; at Trangie Experiment Farm on 9th February, 1932, at "Drummard," and at "Eureka" (experiments A, B and D) the proportions of the ingredients used were, respectively, 10 lb., 10 lb., and 1 lb. per 100 gallons; at Trangie Experiment Farm on 27th April, 1932, the proportions were increased to 13 lb., 13 lb., 18 oz., respectively. At "Tondeburine," 10 lb. white arsenic, 6 lb. stone lime, and 13 lb. washing soda were used per 100 gallons.

Calcium arsenite is a fine white powder, almost insoluble in water.

6.—Paris green in suspension in water. At "Eureka" (experiment A) 10 lb. of the powder per 100 gallons water was used, with 4 lb. soap added.

Paris green is a compound of copper and arsenic, prepared in the form of very fine particles, almost insoluble in water. It colours the wool, but has been shown to wash out in a scouring mixture.

It was thought that the application of mixtures 5 and 6 (finely-divided solids) should result in a more even distribution of poison through the wool, and a greater deposit of poison than when soluble arsenicals are used, since from the excess liquid running off the sheep a certain proportion of suspended particles should, as it were, be strained out and retained by the wool. It was argued that the insolubility of the particles in water need not result in their not being available to blowfly maggots.

7.—Sodium silico fluoride. This substance is a white powder, slightly soluble in water, and at the strength used is partly dissolved and partly distributed through the mixture as a suspension. It is apparently incompatible with soaps, and was used alone or with dilute caustic soda. In the two trials at Trangie Experiment Farm 11½ lb. per 100 gallons was used.

8.—Melaleuca oil. The use of this antiseptic oil for blowfly work was first urged by the Entomologist, Mr. W. B. Gurney, in 1929. Laboratory tests did not indicate a high larvicidal value. For the 1932 experiments it was used emulsified in water by a special proprietary emulsifying agent, which, it was claimed, gave it certain advantages. The mixture applied in these tests contained 1·25 per cent. oil.

The Results of the 1932 Experiments.

Trangie Experiment Farm.—For this experiment 690 flock weaners which had been crutched late in November were used. Two representative groups were jetted with mixtures 5 and 7, respectively, and a third group was left untreated. In addition 157 stud weaners crutched on 8th February were run with the others. The strikes were noted by Mr. Beveridge.

The total strikes, as percentages of the number of sheep in the respective groups, for the periods stated after jetting, are given in the table below:—

—	Percentage of Strikes.			
	2 weeks.	4 weeks.	6 weeks.	8 weeks.
Group 1 (mixture 5—calcium arsenite)	0	1	3	10
Group 2 (mixture 7—sodium silico-fluoride) ...	1·5	5	14	22
Group 3 (untreated)	1	3	16	25
Group 4 (crutched)	0	0	0	1

Jetting was repeated on 27th April. The sheep already struck in Groups 3 and 4 were dressed and noted. Those in Groups 1 and 2 were jetted and not dressed and not noted. On this occasion the calcium arsenite mixture

was used at the rate of 13 lb. white arsenic, 13 lb. stone lime, and 18 oz. caustic soda per 100 gallons of water. Mr. Beveridge noted that some injuries to twenty or thirty sheep had apparently resulted. Such injury had not followed the use of this mixture at lower concentration elsewhere and was ascribed to the increased strength.

The total strikes, as percentages of the sheep in the various groups during the following seven weeks, are set out below :—

—	Percentage of Strikes.		
	2 weeks.	4 weeks.	7 weeks.
Group 1 (mixture 5—calcium arsenite)	5	10	14
Group 2 (mixture 7—sodium silico-fluoride)	12	21	27
Group 3 (untreated)	22	38	51
Group 4 (crutched 8 Feb., 1932)	9	17	26

In this experiment in which crutching was compared with jetting with calcium arsenite, the former treatment appeared as the more effective until the second application of the jetting mixture, when the latter showed to more advantage. It should be noted that the comparison was not made in precisely similar flocks.

It is known that in bad seasons crutched flocks may show an extremely high incidence of strike. A comparison between the two methods under such circumstances of great blowfly activity is very desirable, since many growers who favour jetting seem disposed to abandon crutching.

"*Drummard,*" *Burren Junction.*—For this trial 684 maiden ewes and 662 ewe weaners were treated in five groups on 15th and 16th March, 1932.

The treatments and the percentages of strikes in the various groups during the following three months are set out below :—

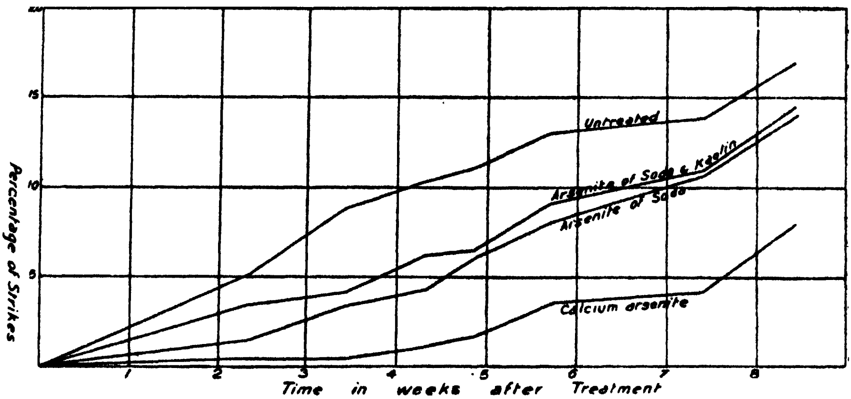
	Percentage of strikes.
Group 1 (mixture 1—a proprietary sheep dip)	6·3
Group 2 (mixture 2—arsenite of soda)	3
Group 3 (mixture 3—arsenite of soda, plus kaolin) ...	3
Group 4 (mixture 5—calcium arsenite)	2½
Group 5 (untreated)	11·3

In addition, 392 older ewes were treated in four groups (the sheep dip not being included). The following percentages of strikes were dressed during the three months after treatment :—

	Percentage of strikes.
Group 1 (mixture 2—arsenite of soda)	1
Group 2 (mixture 3—arsenite of soda, plus kaolin) ...	2
Group 3 (mixture 5—calcium arsenite)	Nil.
Group 4 (untreated)	4

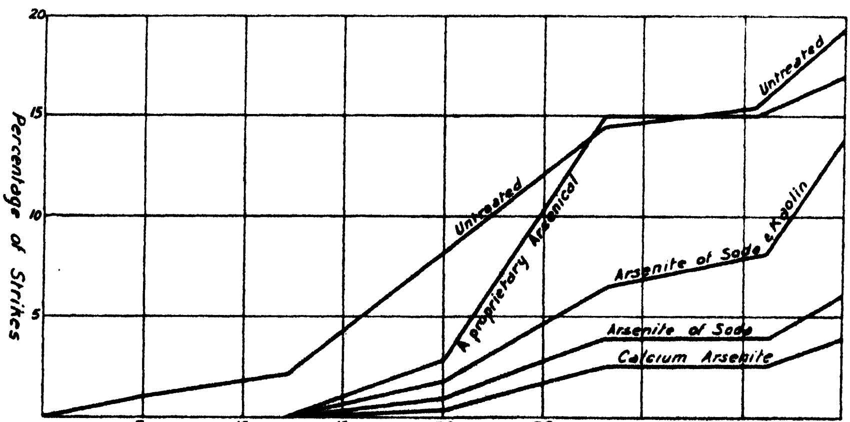
"*Tondeburine,*" *Gulargambone.*—In this experiment 1,184 ewe hoggets, which had been crutched late in January, were treated from 1st to 5th April

n four groups. The mixtures used, and percentages of strike occurring in the various groups during the following eight weeks, are indicated in the accompanying graph (No. 1).



Graph I.—Percentages of Strike after Various Treatments at "Tondeburine," Gulargambone.
The greatest reduction in strike followed the use of calcium arsenite.

"*Warrimbone,*" *Gulargambone.*—At this station 895 ewe hoggets, which had not been crutched since shearing in August, 1931, were treated in five groups on 14th April. The mixtures used and the percentages of strike in the various groups during the following six weeks are indicated in the accompanying graph (No. 2).



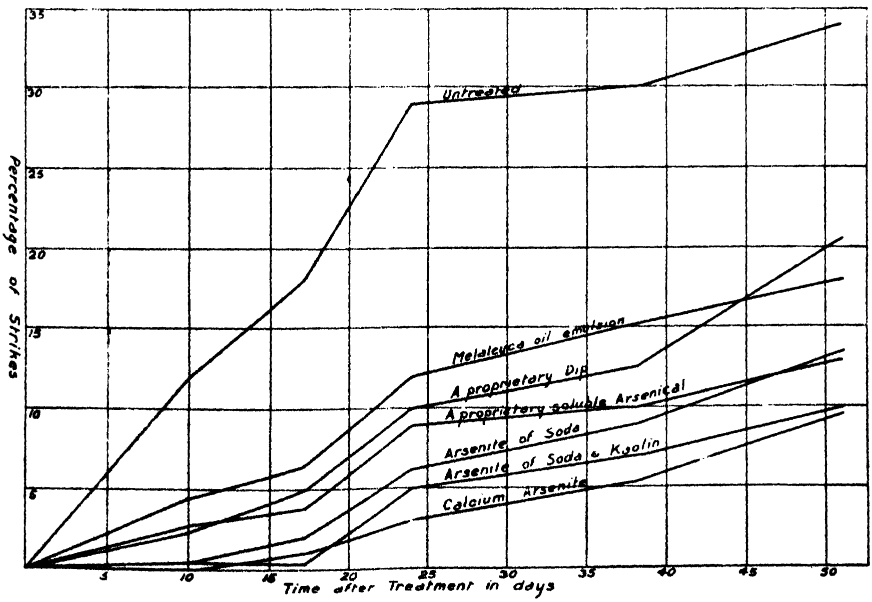
Graph II.—Percentages of Strike after Various Treatments at "Warrimbone," Gulargambone.
The greatest reduction in strike followed the use of calcium arsenite.

It should be noted that the group treated with the proprietary arsenical mixture numbered 100 sheep missed in the first muster in the paddock. They were not classified for susceptibility to fly.

"*Eureka,*" *Gulargambone.*—In Experiment A, 1,120 6- to 8-months-old lambs which had not been crutched, were treated in six groups on 11th April. The mixtures used, and the percentages of strikes during the following eight weeks, are set out in the table below:—

	Percentage of Strikes.			
	24 days.	35 days.	44 days.	56 days.
Group 1 (mixture 2—arsenite of soda)	1	2	3·5	5·5
Group 2 (mixture 5—calcium arsenite)	1	2	5	6
Group 3 (mixture 6—paris green)	2	3·5	4	4·5
Group 4 (mixture 8—melaleuca oil)	3·5	4	6·5	6·5
Group 5 (mixture 1—sheep dip)	1·5	2	7·5	9
Group 6 (untreated)	9	11·5	14	15

In Experiment B, 1,184 ewe hoggets, which had not been crutched since shearing in August, 1931, were treated on 15th April in seven groups. The treatments and percentages of strike in the various groups for the following six weeks are indicated in the accompanying graph (No. 3).



Graph III.—Percentages of Strike after Various Treatments at "Eureka," Gulargambone. The greatest reduction in strike followed the use of calcium arsenite.

For Experiment C, 840 lambing ewes, uncrutched, were treated, as indicated below, on 19th April, with a proprietary mixture of arsenic and soda, both with and without kaolin, to indicate any possible value of the latter.

Incidentally, a small number of sheep left untreated were utilised as a check. Strikes were recorded a month later as follows :—

438 sheep jetted with a proprietary mixture of arsenic and soda at the rate of 8 lb. mixture per 100 gallons	9 struck.
315 sheep jetted with the same mixture as above, with kaolin added	9 struck.
49 sheep jetted with arsenic and soda at the rate of 10 lb. white arsenic per 100 gallons	4 struck.
35 to 40 sheep untreated	10 struck.

A flock of 963 lambing ewes, used for Experiment D, was jetted on 20th April. The treatments and number of each group found to be blown after four weeks are set out below :—

No. of Sheep.	Treatment.	No. blown after 4 weeks.
244	Calcium arsenite (1 per cent. white arsenic)	3
320	Arsenite of soda (1 per cent. white arsenic), plus soap 0·4 per cent. and kaolin, 1 per cent.	12
305	A proprietary mixture of arsenic and soda (8 lb. to 100 gallons)	9
64*	Arsenite of soda (6 lb. white arsenic per 100 gallons)	8
30	Untreated	11

* Already blown.

In neither Experiment C and D were the sheep classified for susceptibility to blowfly attack.

Summary and Conclusion.

The insoluble calcium arsenite used in suspension in water as a jetting mixture appears to give a somewhat greater degree of protection from blowfly strike than does arsenite of soda solution or the sheep dip used. In six of the seven experiments in which they were compared, calcium arsenite showed a moderate or marked superiority, whilst in the seventh it was slightly less effective.

In the one experiment in which Paris green was used the results indicate that it is comparable to calcium arsenite. Here, as in previous tests, it gave promise as a cheap and effective jetting mixture. Further field trials of Paris green and calcium arsenite are in hand.

Soap or dilute caustic soda as a wetting agent in the mixtures reduces the danger of untreated patches occurring in the jetted area.

The addition of kaolin to arsenite of soda solution does not increase its efficiency as a jetting mixture.

Sodium silico-fluoride solutions, as used in these experiments, gave less protection than arsenicals.

Melaleuca oil, applied in a jetting mixture containing 1·25 per cent. oil, as a deterrent of strike, proved somewhat less effective than arsenicals as used in the final reduction of strike.

With the exception of the instance noted at Trangie no apparent injury was seen to result from the use of any of the mixtures, even when applied to blown sheep.

Throughout the experiment in the Gulargambone district it was obvious that the strike on sheep jetted with arsenicals did not spread to nearly so great an extent as on untreated sheep. This would appear to be an important factor.

The writer is greatly indebted to the Entomologist, Mr. W. B. Gurney, who initiated a comprehensive survey of the problems involved in chemical control of sheep blowfly in 1926-7, for his helpful directions and many suggestions in the present experiments.

He is also indebted to the officers of the Chemist's Branch for suggestions relating to the chemical compatibility of the ingredients of possible mixtures.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Tomatoes—

Improved Sunnybrook Earliana ... ... Mr. Albert Sorby, Macquarie Fields.
Marglobe ... ... Mr. S. A. Spicer, "Billabong," Lewis Ponds.

Asparagus—

Connover's Colossal ... H. Eastwood, Tascott, *via* Woy Woy.

Cucumbers—

Early Fortuna ... ... Mr. W. Parry, Terrigal.
Mr. E. Money, Terrigal.

Grasses—

Perennial Rye Grass ... Mr. C. Watson, Pyree, *via* Nowra.
Sudan Grass ... ... Messrs. F. and H. Owen, "Applegrove," Duri.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

The Effect of Top-dressed Pasture on Sheep and Wool.

ANOTHER YEAR'S RESULTS AT YOUNG AND BUNGENDORE.

E. A. ELLIOTT, Sheep and Wool Expert.

TRIALS, commenced in 1928, to determine the effect of top-dressed pastures on sheep, particularly on the weight and quality of wool, were continued last year on the properties of Messrs. F. H. Tout & Co., "Wambanumba," Young, and Col. T. F. Rutledge, "Gidleigh," Bungendore.

To date the results of these trials have been anything but conclusive; and while, on the whole, they seem to supply some evidence to support the contention that top-dressed pastures tend to coarsen the wool fibre, this tendency has been so slight—in some instances not in evidence at all—that it might possibly have been caused by some other factor. It is certain that the trials will have to be continued for some years yet before definite conclusions can be arrived at.

Abnormal Pasture Growth Causes Foot-rot.

Unfortunately, the seasonal conditions almost rendered useless the results obtained last year at "Wambanumba." The abundant autumn and winter rains of 1931 produced an abnormal growth of feed on this property, and resulted in an outbreak of foot-rot—the first outbreak for over twenty-five years. This trouble was more in evidence on the top-dressed area, probably because of the heavier growth of feed in the treated paddock. Some of the trial sheep were also affected with ophthalmia. Naturally the affected sheep lost condition, and at shearing time a number of them were low in condition. Heavy stocking with large stock would have kept down the growth and so lessened the prevalence of footrot, but the growth was so abundant over the whole of the property that sufficient large stock were not available to control it.

The "Wambanumba" Trial.

At "Wambanumba" 100 young wethers were selected for evenness of frame and wool, and fifty put into each of the experiment paddocks on 29th October, 1930. On that date there was a heavy growth of feed in both paddocks, though considerably more in the top-dressed than in the natural pasture paddock, the feed in the former consisting principally of clovers and herbage. This paddock had been treated with 1 cwt. superphosphate per acre in the autumn of 1930. During the year, except for the mating period, each paddock carried at the rate of approximately two sheep per acre.

The average weights at intervals throughout the trial were as follows:—

TABLE showing Average Body Weights at Different Dates.

Group.	29 Oct., 1930.	9 Jan., 1931.	13 Mar., 1931.	12 May, 1931.	14 July., 1931.	22 Oct., 1931.	22 Oct., 1931. (Shorn).
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Natural pasture ...	85	89·42	84·74	84·25	95·03	98·74	87·12
Top-dressed pasture..	83·6	88·56	85·93	85·5	99·39	91·6	80·14

Very little difference was noticeable between the wool of the two groups. That from the group on top-dressed pasture was very slightly stronger, though hardly sufficiently so to signify in "counts," while in addition it was of better length. Both lots were well nourished, and the estimated "yield" was 62 per cent. for those on natural pasture and 64 per cent. for those on top-dressed pasture.

The fleeces were classed into the ordinary clip lines, and the average weight of fleece, the classifications, and the average fleece values were as follows:—

TABLE Showing Particulars of the Clip.

Group.	Fleece Weight.	Classification of Fleeces.					Average Value.	
		AAA.	AA.	A.	1st. Com.	AAF.	Per Sheep.	Per acre.
	lb.						s. d.	s. d.
Natural pasture ...	11·625	32	12	...	2	4	11 4	22 8
Top-dressed pasture ...	11·45	27	17	2	1	3	11 1	22 2

The "Gidleigh" Trial.

As in the other trial, the aged wethers used in previous years were replaced by selected young wethers. Fifteen sheep were put in each trial paddock on 29th October, and additional sheep added to bring the stocking up to one sheep per acre in the natural pasture paddock and one and a half sheep in the top-dressed paddock.

The winter at Bungendore was also very good, and though feed became very short during the late summer, causing both groups to lose condition, this was later regained, and both lots showed a marked increase in weight after the winter. During the spring curl grubs caused large areas of the top-dressed paddock to become almost bare, which may be the reason for the slight decrease in body weight of the group on the top-dressed pasture in August and the slightly lower average wool weight.

TABLE Showing Average Body Weights at Different Dates.

Group.	3 Feb., 1931.	5 May., 1931.	18 Aug., 1931.	23 Oct., 1931.	Increase since first Weighing.
	lb.	lb.	lb.	lb.	lb.
Natural pasture	94·1	86·6	99·1	115	20·9
Top-dressed pasture	94·1	88·8	96·2	115·13	21·

The wool of both groups was particularly bright, attractive, and well grown. No difference could be noticed in colour and condition between the wool of the two groups. Although rather variable, the "counts" of the bulk were 64's to 66's.

TABLE Showing Average Fleece Weights, Classification of Fleeces, &c.

Group.	Average Fleece Weight.	Classification of Fleeces.				Average Value.	
		Super.	AAA.	1st Comb.	1st Fleece.	Per Sheep.	Per Acre.
	lb.					s. d.	s. d.
Natural pasture ...	11·87	2	6	5	1	10 9	10 9
Top-dressed pasture ...	11·4	1	10	4	...	10 4	15 6

Worm infestation on both properties throughout the year was practically nil.

BULK TRUCK ARRANGEMENTS FOR NEXT HARVEST.

To enable wheat growers in the north and north-west wheat districts to avail themselves of bulk-handling facilities—no silos have been erected in these districts—up to 500 bulk trucks will be made available in those parts of the State between 1st and 21st November. It will not be possible to continue this arrangement beyond the latter date, as the whole of the bulk trucks will then be required to remove the overflow from silo plants in other districts. In any case, it is estimated that these arrangements will result in filling the maximum space allotted in the Sydney terminal elevator for wheat from non-silo stations, and it also means that it will not be possible to provide any bulk trucks for non-silo stations in the southern and western districts. Moreover, the Department is under an obligation to take all bulk wheat offering at stations where silo accommodation is provided, and it would amount to a breach of faith with growers in those districts to refuse to take delivery of bulk wheat on the ground that storage for the overflow was not available at the Sydney terminal.

Timely notice of these arrangements is given so that growers will have an opportunity to make arrangements for the supply of bags and to take advantage of the low prices now ruling for cornsacks.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
P. Ubrihien, Corridgeree, Bega	138	2 Aug., 1932
Grafton Experiment Farm (Ayrshires)	193	4 „ 1932
St. John's College, Woodlawn, Lismore	40	11 „ 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	13 „ 1932
A. L. Logue, Thornboro, Muswellbrook	41	14 „ 1932
E. E. Winder, Wybong Road, Muswellbrook	46	14 „ 1932
Gladesville Mental Hospital	40	14 „ 1932
Coast Hospital, Little Bay	66	15 „ 1932
Lunacy Department, Parramatta Mental Hospital	33	16 „ 1932
William Thompson Masonic School, Baulkham Hills	45	16 „ 1932
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns)	100	20 „ 1932
A. H. Webb, Quarry Road, Ryde	4	24 „ 1932
E. E. McMullen, Springnook, Holbrook	32	25 „ 1932
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 „ 1932
Sacred Heart Convent, Bowral	10	26 „ 1932
W. R. Boughton, Holbrook	22	27 „ 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	31	28 „ 1932
Department of Education, Gosford Farm Homes	38	2 Sept., 1932
James McCormack, Tumut	98	9 „ 1932
Wagga Experiment Farm (Jerseys)	64	16 „ 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 „ 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 „ 1932
St. Patrick's College, Goulburn	7	21 „ 1932
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 „ 1932
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 Nov., 1932
Wolaroi College, Orange	11	19 „ 1932
Lunacy Department, Callan Park Mental Hospital	31	20 „ 1932
Berry Experiment Farm	129	26 „ 1932
J. B. Burtenshaw, "Sunnyside," Inverell	36	27 „ 1932
Parker Bros.; Hampton Court Dairy, Inverell	74	27 „ 1932
W. K. Frizell, Rosenstein Dairy, Inverell	44	28 „ 1932
J. L. W. Barton, Wallerawang	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood	8	3 „ 1932
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 „ 1932
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	9	3 „ 1932
A. N. de Fraine, Happy Valley Dairy, Inverell	9	6 „ 1932
W. Pigg, Redlands Dairy, Inverell	33	6 „ 1932
Lunacy Department, Morisset Mental Hospital	27	7 „ 1932
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 „ 1932
Newington State Hospital and Home	100	17 „ 1932
W. T. Herbert, Racecourse Farm, Bega	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega	78	8 „ 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 „ 1933
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys)	80	22 „ 1933
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 „ 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 „ 1933
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
New England Girls' Grammar School, Armidale	29	3 „ 1933
Lidcombe State Hospital and Home	149	3 „ 1933
G. L. Genge, "Easton," Armidale	33	4 „ 1933
A. B. Finney, Fox Ground, Gerringong	29	11 „ 1933
George Rose, Aylmerton	3	23 „ 1933
Riverina Welfare Farm, Yanco	89	24 „ 1933
Department of Education, Yanco Agricultural High School	39	24 „ 1933
Mittagong Farm Homes	36	24 „ 1933
Liverpool State Hospital, Liverpool	72	8 Mar., 1933
Miss Brennan, Arankamp, Bowral	17	8 „ 1933
G. W. Young, "Boorganna," via Wingham	41	10 „ 1933
Lunacy Department, Kenmore Mental Hospital	80	27 „ 1933
P. M. Burtenshaw, Killean, Inverell	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra	20	6 „ 1933
A. D. Frater, "Fairview Dairy," Inverell	51	6 „ 1933
A. H. Pye, Loch Levan, Inverell	47	7 „ 1933
W. Newcomb, "Minnamurra," Inverell	72	7 „ 1933
Rydalmere Mental Hospital	77	7 „ 1933
St. Joseph's Girls Orphanage, Kenmore	11	18 „ 1933

Tubercle-free Herds—*continued.*

Owner and Address.	Number tested.	Expiry date.
St. Joseph's Convent, Reynold-street, Goulburn	3	14 April 1933
St. Michael's Novitiate, Goulburn	4	14 „ 1933
Marion Hill Convent of Mercy, Goulburn	47	15 „ 1933
G. A. Parish, Jerseyland, Berry	93	21 „ 1933
Australian Missionary College, Cooranbong	72	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra	76	6 „ 1933
Koyong School, Moss Vale	3	11 „ 1933
James Wilkins, "Jerseyville," Sandy Creek Road, Muswellbrook	40	12 „ 1933
Tudor House School, Moss Vale	14	13 „ 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 „ 1933
W. Hammond, Bellingen	77	16 „ 1933
Hurlstone Agricultural High School, Glenfield	44	22 „ 1933
E. C. Nicholson, Jillamatong, Corowa	180	23 „ 1933
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 „ 1934

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.

—Max Henry, Chief Veterinary Surgeon.

Infectious Diseases Reported in June.

The following outbreaks of the more important infectious diseases were reported during the month of June, 1932:—

Anthrax	Nil.
Blackleg	10
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	2
Swine fever	Nil.
Contagious pneumonia	Nil.
Necrotic enteritis	1

—Max Henry, Chief Veterinary Surgeon.

How to Store Honey.

If honey is stored in a damp place and not thoroughly sealed up it will absorb moisture, and if excessive moisture is so taken up the honey is liable to ferment and deteriorate in value. Do not leave the lid off the containers or leave honey exposed for any length of time during the late autumn and winter months. If kept in a dry place in a sound container honey will keep good for years; it may granulate, but that is not a sign of deterioration, and in such cases it may easily be liquefied by immersion of the container in hot water.—W. A. Goodacre, Senior Apiary Instructor.

Dairying Notes.

A New Production Record.

In his address before the Annual Conference of the New South Wales Dairy Factory Managers and Secretaries' Association, held in Sydney early in July, Mr. L. T. MacInnes, Director of Dairying, stated that for the year 1931-32 a new production record had been established. The previous peak year was 1924-25, when throughout the State the weather, from a production point of view, was uniformly excellent, the quantity of butter produced being 52,325 tons. For 1931-32, with the handicap of very dry weather over the heaviest producing part of the year and in the most important producing areas, it was estimated that production of butter reached 56,300 tons, exceeding the old record by 4,000 tons.

Coastal production owing to the vagaries of the weather and shortage of feed showed an increase of only 1,653 tons (3.7 per cent.); tableland production an increase of 148 tons (23.7 per cent.); western slopes an increase of 2,699 tons (82 per cent.). The respective 1931-32 outputs were approximately:—

	Tons.	Per cent.
Coastal factories	46,554	82·7
Tableland factories	772	12·0
Western Slopes factories	5,974	
Farm dairy butter...	3,000	5·3
	56,300	

Extension of Inland Dairying.

The rapid and wide-flung expansion of dairy farming on the western slopes of the Dividing Range was, said Mr. MacInnes, the most important development in recent years. This area extended from Victoria to Queensland, 700 miles, and reached to some 300 to 400 miles back from the coast. The total area changed over from wheat and wool production covered about 75,000 square miles.

It was most desirable that this development take place on an organised plan, local rivalries and desires being subordinated to the general welfare. Unnecessary expenditure of capital, especially at the present time, should be avoided. The Government policy was to develop this country to dairying on sound lines—to lay the foundations in such a manner that the industry would be of a permanent nature. The dairies and the factories now being provided were of the same standard as the most modern in the older dairying districts. Choicest cream could be produced and choicest grade butter marketed. Advice was being given and followed to provide a good feed supply for stock to carry on successfully during lengthy droughts. As the area embraced what is called "herbage country," the maximum production period was from April to October each year, while that on the coast was from October to April.

Every additional ton of butter now produced meant a similar quantity exported overseas. Regular shipments each week of the year would be a great advantage, especially on the British market, and in view of possible Ottawa developments. The permanent establishment of butter, cheese and bacon manufacture over the Western Slopes would provide a means of large scale production throughout each year, and, with the coastal surpluses, regular shipments overseas.

Properly organised and properly conducted dairying operations in this area should make possible an annual output of 40,000 tons of butter in a few years, and a yearly distribution of over £5,000,000 to its dairy farmers.

Dairying is Australia's Premier Industry.

The official statistical estimates for the total realisation values of dairy produce, wool and wheat, for the year 1931-32 are as follows:—

	N.S.W.	Australia.
	£	£
Dairy produce	12,000,000	39,000,000
Wool	15,500,000	30,000,000
Wheat	7,400,000	26,000,000

To-day, dairying is the premier of all industries (primary and secondary) in Australia in regard to value of total production, number of persons engaged or dependent thereon, and capital invested. Dairying is finding employment and sustenance for many additional thousands. In short, the claim can be reasonably made that in this time of financial and industrial crisis Australia is being carried "on the cow's back."

Herd Recording is Essential to Profitable Dairying.

Dairy herd yields are dependent (1) on the inherent production capacity of the cows and of the strain from which the sire comes, and (2) on the feeding of the cows. Herd recording is essential in order that these two factors may be directed towards the improvement of the yields.

The first result of testing is the identification of the low producers, enabling them to be culled out. It has been definitely proved on many occasions that high production cannot be determined with certainty by relying on outward appearances such as body formation, the size of the milk veins, and shape and size of the escutcheon.

The animals left in the herd may then be better looked after and better fed. Many examples may be quoted where the smaller culled herd of higher producers has given an annual yield equal to or greater than the larger herd previously kept, and at a smaller cost. Then, when hand-feeding, the testing gives an actual check on the results being obtained and the farmer can immediately arrive at a conclusion as to whether the feeding is paying or not.

The official recording year commences on 1st October next, and farmers whose herds are not yet being tested, and who desire to have this check on the production of their cows, should get into touch with their local Senior Dairy Instructor or with the Director of Dairying, Department of Agriculture, Box 36A, G.P.O., Sydney.

There are numerous dairy farms situated so far apart that it would be a very costly business to establish and conduct a recording unit. In such instances the farmers concerned are strongly advised to buy a small Babcock machine and undertake the testing of their own stock. How to test is easy to learn; the procedure is simply and plainly described in Farmers' Bulletin No. 161, "Testing Dairy Cows for Herd Improvement," which may be obtained from the Department, price 1s. 1d. posted. If any farmer wants further advice and instruction it will be gladly given by the certificated tester at the dairy produce factory to which he sends his milk or cream, or it can be arranged for an officer of the Dairy Branch, Department of Agriculture, to visit such a farm and give a demonstration for the owner's and his neighbours' benefit.

Influence of Number of Milkings on Production.

According to experiments carried out at the Agricultural Experiment Station of Nebraska, high-producing Holstein, Jersey, Ayrshire and Guernsey cows of various ages milked three times daily produced from 39.69 to 52.26 per cent. more fat and from 44.98 to 65.18 per cent. more milk than cows milked twice daily. When high-producing cows of all breeds milked four times daily were compared with cows milked twice daily the fat production for the several age classes varied from 110.19 to 127.53 per cent. and the milk production from 149.08 to 160.31 per cent. greater for those milked four times. Milking high-producing cows four times as compared with three times daily showed an increased fat production ranging from 44.70 to 59.81 per cent., while comparable increases for milk ranged from 51.99 to 71.79 per cent. There was a slight tendency for additional daily milkings to increase the percentage of fat in the milk. The influence of additional milkings was greatest when carried through the entire lactation period.

Soldering Work on the Dairy Farm.

Before the flush season of production comes round again, dairy-farmers should ensure that all the plant and equipment is in good order. No farmer has to use tinware of various descriptions to the same extent as the dairyman, and an elementary knowledge of the use of the soldering iron is of particular value of his case—in fact it might almost be considered a necessary part of a dairy-farmer's training. The mending of leaks, the re-tinning of rust spots, the re-fixing of milkcan hoops, &c., are all jobs that are possible to a man determined to master a few essentials of the process. It is the continuous neglect of the rough places in tinware that has such a serious effect on milk and cream quality, by affording lodging places for decaying milk and cream. The exposed metal is also attacked by the acid in the cream, and this is responsible for some of the flavour defects in butter. A few drops of solder will quickly rectify these tinware faults.

A description of the process of soldering, with particular reference to its use on a dairy farm, is the subject of a leaflet which may be obtained free on application to the Department.

An Improved Sweep for Filling Pit Silos.

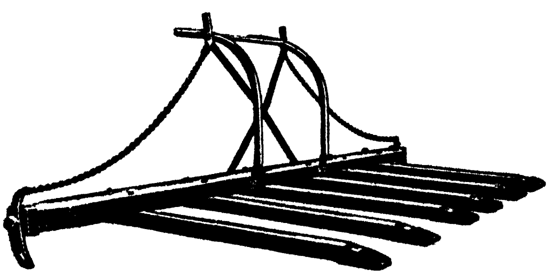
A Means of Cheapening the Cost.

A. T. R. BROWN, Senior Dairy Instructor.

THE past season will long be remembered in the Illawarra district for its prolific pasture growth and for the activity of farmers in converting the surplus of grass into silage. Grass is the most valuable crop grown in the State, and during the past few years considerable attention has been given to the management of pastures in the Illawarra, splendid results having been achieved by top-dressing and subdivision of paddocks and rotational grazing. Admittedly this season has been one of even rainfall, but former good seasons were never availed of as was the past one.

Pasture management has come to stay on this part of the coast, and those farmers who have put it into practice and have conserved the surplus pasture as silage have set an example which will be followed by other dairymen.

Stacks, pits and overhead silos are all used for conserving fodder. Cost of production is naturally the first consideration of the producer, and while each method has its good points, where the locality is suited to it, pitting has the advantage that it is the cheapest and quickest.



The Type of Sweep Described.

An instance of the cheapness with which surplus pasture can be conserved in a pit silo recently came under notice, when Mr. R. Shepherd, of Bomaderry, Nowra, cut, gathered and filled a pit with growth from an 11½-ton-per-acre crop of paspalum at an estimated cost of 2s. 9d. per ton.

This he was enabled to do by the use of a "tumble" sweep for gathering the crop, this implement combining speed with ease of operation. I had the pleasure of witnessing the ensiling of this crop and the minimum of labour attached to gathering the crop with this sweep and tilting the material into the silo made an appeal on the grounds of efficiency, and provided a distinct contrast with the arduous and more costly method of loading on to and unloading from a slide.

Gathering the Crop with the Sweep.

The Filling of the Pit Silo almost Completed.
Note the boards which are used to assist the sweep to gain the top of the heap.

Tipping the Sweep.

Details of its Construction.

The foregoing illustrations show a sweep of this type and the one in use on Mr. Shepherd's farm. The implement used by Mr. Shepherd is a home-made one with eight tines and he has supplied the following particulars of its construction:—

The main beam is of 6-inch x 3-inch timber, 9 feet 8 inches long, and tapers for a distance of 8 inches from each end. The tapered portion is shod with iron, and into the ends are bolted the bars (which may be rotated) and which carry the chains to the handles and the trace hooks. Eight tines, each 3 feet 9 inches long by 2¾ inches wide by 2 inches deep are fitted about 9 inches apart, the end ones being about 14 inches-from the end of the main beam. The tines taper for 6 inches towards the point and are shod with iron.

Skids 9 inches long by 3 inches deep by 2½ inches wide are fitted under the third tine from each end flush with the back of the main beam and tapered for about 4 inches on the front ends. These also are shod with iron on the front and underneath. (See illustration on page 582.)

The handles are bolted to the front of the main beam, being centred about 2 feet apart; they are about 40 inches long. To these a cross bar and two brace stays are fitted, and also the "snigs," which are short bars of iron which carry on their lower ends the chains attached to the bars at the ends of the main beam. These "snigs" have sufficient play so that when the chains tighten as the sweep is moved forward after tipping the load, the top arm is forced forward by the pull on the chains and is engaged in the ground, enabling the sweep to be turned a second time—back to its normal position.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36a, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Peak Hill, (W. R. L. Crush)	Aug.	2, 3
Trundle (D. Leighton)	"	9, 10
Condobolin (J. M. Cooney)	"	16, 17
Gilgandra	"	16, 17
Grenfell	"	23, 24
Wagga Wagga (F. H. Croaker)	"	23, 24, 25
Bogan Gate (J. a'Beckett)	"	24
Illabo	"	24
Lake Cargelligo (G. A. Crockett)	"	24, 25
Parkes (L. S. Seaborn)	"	30, 31
Ungarie	"	31
Young (T. A. Tester)	"	31, Sep 1
Gunnedah	Sept.	2, 3
Forbes (E. A. Austen)	"	6, 7
Murrumburrah (W. Worner)	"	6, 7
Finley	"	7
West Wyalong (T. A. Smith)	"	7, 8
Boorowa (S. G. Hughston)	"	8, 9
Galston	"	9, 10
Cowra (E. P Todhunter)	"	13, 14
Barmedman	"	14
Singleton	"	14, 16
Canowindra (W E. Frost)	"	20, 21
Temora (J. M. McInnes)	"	20, 21, 22
Lockhart	"	21
Quandialla	"	28
Berrigan (R. Wardrop)	"	28
Barellan	"	28
Hillston	"	28, 29
Hay	"	28, 29
Narrandera (J. D. Newth)	Oct.	4, 5
Bribbaree (K. McCallum)	"	5
Leeton (B C. Tweedie)	"	11, 12
Ardlethan (E. C. Knight)	"	28
Ariah Park (M. Collings)	"	12
Corowa (H. G. Norton)	"	13, 14
Griffith (M. E. Sellin)	"	18, 19
Cootamundra (G. B. Black)	"	25, 26

1933.

Dungog (W. H. Green)	Mar.	30, 31, Apl. 1

Some Considerations on Quality in Wheat.

H. WENHOLZ, B.Sc.Agr., Director of Plant Breeding.

FROM the time William Farrer supplanted the very late soft wheats of low quality in Australia with Federation and other varieties of better quality at the beginning of the present century, there has been a growing interest in the quality of Australian wheat. Despite the production of Farrer wheats of very high quality, such as Comeback, Bobs, Cedar, Jonathan, etc., these varieties never made much headway in commercial culture against the more productive varieties (Federation, Yandilla King, etc.) of medium weak or medium strong flour quality, which at present constitute Australian wheat.

Because of changes, chiefly in the direction of greater mechanisation in the baking industry, which have taken place throughout the world in recent years, the demand for wheat or flour of high baking quality has become more widespread, and this demand is now becoming more insistent in Australia. Every now and then millers, merchants and bakers handle a sample of Comeback or some other variety of specially high quality grown for show or special exhibition purposes in Australia, and realising its excellent baking value, urge farmers to grow such wheat commercially.

The whole question of wheat or flour quality is of such wide interest and is receiving such general attention that the wheat breeder, who really holds the key to the future situation as to the quality of new varieties, is justified in examining the position in Australia in the light of recent developments and in taking whatever action seems necessary or advisable.

Conflicting Interests.

On account of the present low world prices for wheat the Australian wheat-grower is in the midst of (or, it is hoped, is passing through) one of the most difficult periods of his career, and he needs now, more than ever, every possible political, economic, technical and practical assistance, in addition to the greatest efficiency on his own part, to make wheat-growing profitable or to enable him to remain in the industry.

The particular variety or varieties of wheat grown play a big part in the wheat-grower's profits or returns from his crop, and he needs to make his choice of these varieties with the greatest consideration. In Australia, wheat is not graded for market, but is sold on an f.a.q. (*i.e.*, fair average quality) standard, based almost entirely on bushel weight. Wheat that has a lower bushel weight than the f.a.q. standard is subject to price dockage, but the grower does not get any premium for wheat of higher bushel weight than the f.a.q. standard. The milling quality, a term which has been used in Australia as synonymous with baking quality, is not considered in determining the f.a.q. standard, and, except in a few instances, millers do not generally give any premium for wheat of high flour strength or baking quality. The farmer's

chief consideration, therefore, in the choice of a variety is bushels per acre. The only other consideration is that the grain should not, if avoidable, suffer damage or deterioration from disease (rust, smut, etc.), drought, weather damage (bleaching, etc.), which will decrease its bushel weight below that of the f.a.q. standard.

The grain merchant naturally likes to handle as much grain as possible above f.a.q., for which he seldom pays an increased price, as it can, if desired, be blended with wheat below f.a.q. purchased at a lower price to make an f.a.q. sample. He is also naturally interested in wheat of high flour quality, since most of his sales go eventually to millers chiefly overseas, who desire a general improvement in flour quality. The local flour miller usually buys his requirements direct from the farmer.

The miller is chiefly concerned with the cleanliness, soundness, plumpness and brightness of the grain, which he desires to be easy to mill and to yield a high percentage of flour, if possible, of good baking quality.

The baker desires a flour of standardised or uniform quality, of good colour and of high water absorption from which a large number of loaves can be made from a given weight of flour, and which is also capable of giving a loaf of large volume and of good texture.

Each of these people look to the wheat breeder to evolve the type of wheat they desire, without much thought or consideration for the other people concerned. The breeder must give serious consideration to the type of wheat evolved, and it is his duty to bring about some measure of unity, if possible, between these apparently different or conflicting requirements of the farmer, grain merchant, miller and baker. Since it takes about ten or fifteen years from the time a cross or selection is made by the wheat breeder before the new variety comes into general cultivation, a heavy responsibility thus rests on the breeder, and his efforts must be directed as early as possible into the wisest course.

There are many other characters which the breeder must consider in breeding new varieties of wheat, such as disease resistance, strength of straw, grain holding capacity, drought resistance, etc., but we are dealing here with the question of grain or flour quality, and we shall attempt to see how far it seems possible to secure the compatibility of all interests in a breeding programme.

To begin with, let us try and understand more clearly what is involved in the term quality or strength, as applied to wheat grain or flour.

Character of Grain and Baking Quality.

The baking quality of wheat flour is generally defined as its capacity to produce loaves of large volume and of good texture and colour. It is well known that the most important factor in the determination of flour quality or strength is the gluten, in which the nitrogenous portion of the flour is chiefly contained. It is not only the quantity of gluten, but also (perhaps chiefly) its quality, which is of importance in determining the baking quality or strength of the flour. A flour which contains a large quantity of gluten

of good quality has a capacity to absorb a large quantity of water, and also yields dough which is sufficiently tough and elastic to stand a large amount of kneading and also to be capable of holding the gas generated in the leavening process.

To explain most simply the effect of gluten on baking quality, the gluten may be regarded as comprising the walls of a cell which is being subjected to pressure from within by the expansion of gas created by the yeast organisms in the dough. A low percentage of gluten in the flour means that the cell walls are thin, and not being able to withstand a high pressure, give way and allow the gas to escape. Such a flour does not make a loaf of good volume. A high percentage of gluten in the flour will give thick cell walls, which may stand pressure well and give a well risen loaf. The gluten may, however, be present in sufficient quantity to make thick cell walls, but it may be of poor quality, having insufficient elasticity to stand much stretching without breaking. In this case also, the gas escapes and the resultant loaf is not of large volume. A high pressure is tolerated by cell walls of high elasticity, which accompany gluten of good quality. The highest loaf volume and the best loaf texture are therefore generally attained with flour containing a high percentage of gluten of good quality.

The appearance and texture of the grain bear some relation, but are only a rough guide, to the quantity and quality of the gluten it contains. Soft wheat is of opaque appearance and of low gluten content, and being generally also of low gluten quality it is of poor baking quality, and is said to possess weak flour. Hard wheat is generally of horny, translucent or vitreous appearance (though some hard grain may be dull and opaque). It cannot be assumed, however, that all hard grain has the highest quantity or quality of gluten. It is for this reason that tests are necessary to determine both the quantity and quality of gluten in wheat. Strong flour wheats are those which are good in both these characters and which are therefore of good baking quality.

The protein content of the grain, however, bears a close relation to the quantity of gluten contained in the flour. High protein wheat is considered in U.S.A. to be so generally indicative of good baking quality that premiums are paid for such wheat in that country.

Factors Influencing Grain Quality.

The term quality as applied to grain may here be taken to mean the baking quality of the flour milled from it. Thus, grain quality depends on both the quantity and quality of its gluten. The actual quality of the grain produced is determined by both heredity and environment, *i.e.*, chiefly by the kind or variety of wheat and the climatic and soil conditions under which it is grown.

There is reason to believe that quality of gluten is an inherent character which is not modified to any appreciable extent, by environment. On the other hand, the quantity of gluten in a sample of wheat is determined both by environment (chiefly climate) and by heredity (the variety). Durum

or macaroni wheats are generally of comparatively high protein or gluten content, but the quality of the gluten is usually poor. The protein content of these wheats is influenced to some extent by the climate in which they are grown, but the climate has no appreciable effect on the quality of their gluten. The original Red Fife wheat of Canada has gluten of inherently good quality, and this character has been transmitted to many of its offspring, *e.g.*, Marquis, Reward, Garnet, Yeoman, Comeback, etc. The protein or gluten content of these wheats is generally good, but it is influenced markedly by climate. The climate has probably a greater influence than that of heredity (variety) on the protein or gluten content of the wheat, but its influence on gluten quality is insignificant by comparison with that of the variety or kind of wheat.

Climate is the chief factor in the environment which influences grain quality and texture. Wheat grown in countries or districts where the maturing period is prolonged by cool moist conditions is soft in texture and poor in gluten content in comparison with the hard wheat produced in warmer and drier regions. The slow ripening prolongs the retention of chlorophyll and the elaboration of starch and its translocation to the grain, while quick ripening tends to prevent this, and the diminished starch content promotes a higher protein content and a harder grain. Thus late-maturing wheats tend to be softer than early-maturing wheats, but the texture and quality of the grain are more greatly influenced by the period of kernel development than by the total length of the growing period.

Of course it must be realised that a prolonged ripening period which favours the production of soft grain also corresponds with high yields, and it therefore seems that high yields and high quality grain are not compatible. Any attempt by the breeder to increase the quality of wheat too greatly may therefore result in loss of yield. This would probably be the case, especially in late-maturing varieties or in cool districts.

Soils rich in nitrogen naturally tend to produce harder grain of higher nitrogen content than soils poor in nitrogen, unless they favour high moisture retention and slow ripening. The application of nitrogenous fertilisers has a similar effect in some countries. Similarly, soils in which nitrification is active yield better quality grain than those of poor nitrifying character, and for this reason fallowed land generally produces grain of somewhat better quality than stubble land of similar character. The intake of nitrogen by the plant during its growth (especially during its early growth) also influences the protein content of the grain, and this is why, other things being equal, a mild dry winter gives grain a better quality than a cold wet winter—really a question of nitrification in the soil and the abundance and availability of nitrogen to the plant in its early growth.

A further contribution on this subject will deal with the effect of the Australian climate, and of New South Wales in particular, on the quality of wheat.

Fodder Conservation Competitions, 1932.

INLAND DIVISION CHAMPIONSHIPS.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

DISTRICT competitions were organised by six societies, including two in the Middle-west, two in the Central South-west, and two in the North-west Divisions; for the first year since the inception of these competitions, no society in the Riverina Division was represented. The response was not as satisfactory as in the previous year, when eight societies in inland districts conducted competitions. This may be attributed to several causes, chief of which, no doubt, is the general unsatisfactory economic position. Some societies find it difficult to provide funds for the expenses incurred in connection with a competition; this year Trundle Society solved this problem by organising a competition on the basis of no entrance fee and no prizes, which attracted five entries. No doubt there are several districts where stockowners are sufficiently interested to compete under similar conditions, just for the honour of winning—or perhaps better still, for a certificate which would serve as a record of achievement.

Owing to the unprofitable returns from sheep husbandry, due to the low wool prices which have ruled during the past couple of years, many stockowners are not in a position to incur the expense of conserving fodder, and there are some who entertain doubts as to whether it is profitable to practise the conservation of fodder in the present circumstances. Possibly, there may be some grounds for this assumption when an attempt is made to conserve sufficient fodder in one year by specially cultivating crops for the purpose, but it does not apply when reserves are accumulated gradually—putting by any surplus fodder, and in prolific seasons, making use of volunteer growths such as self-sown wheat and wild oats, which may be converted into silage merely at the cost of cutting and pitting.

The season was not favourable for the production of high yields of fodder, the waterlogged soil condition in most districts being inimical to satisfactory growth of crops, while the damage wrought to hay stacks by the invasion of mice was no doubt a factor in limiting the number of entries this year. What may have been lacking as regards the number of entries, however, was amply atoned for by the very high standard of the exhibits, which were distinctly superior to those submitted in previous years.

The conditions and scale of points for judging the competitions were as follow:—

Fodders Eligible for Conservation to be—Concentrates (including all grains); or roughage—as hay (*e.g.*, lucerne, oaten, wheaten, barley, clover, grass), straw, or silage; and any other fodder suitable for conservation; to have been produced on the land owned, leased or held on shares by the competitor. No farmer or grazier whose holding consists of less than 150 acres will be eligible to compete.

SCALE OF POINTS FOR JUDGING—AREAS OTHER THAN COASTAL.

		Points.
1. *Suitability and quality of fodder*		60
(*a*) Judged according to suitability of fodder or combination of fodders for the purposes for which they are required	25	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	35	
2. *Location and protection*		45
(*a*) Locality—location of the site, having regard to fire, flood, economy in feeding, and general access	10	
(*b*) Protection—protection from weather, pests, stock, fire and general deterioration	35	
3. *Economy of production*		15
Including land value, production, storage and feeding costs.		
4. *Carrying capacity*		60
Quantity for requirements of competitor's holding to be based on the sheep carrying capacity of the holding (when improved, and under natural pasture). The maximum amount to be considered competitor's requirements per sheep to be 5 cwt. lucerne hay or its equivalent in feeding value (1 cwt. lucerne hay = 1½ cwt. cereal hay = 3 cwt. silage = 4 cwt. straw = ½ cwt. grain).		
Total		180

Middle-west, Central South-west, and North-west Championship.

For the purpose of the championship competition, the Middle-west, Central South-west, and North-west Divisions were combined, the societies represented being Ariah Park, Boggabri, Canowindra, Dubbo, Trundle and Wee Waa. Judging was commenced at Dubbo on 17th May, and completed at Wee Waa on 26th. The awards were as follow:—

Society.	Competitor.	Suitability and quality of fodder.		Locality and protection.		Economy of protection.	Carrying capacity.	Total.
		(*a*)	(*b*)	(*a*)	(*b*)			
Trundle ...	Mr. K. Gault, "Lynwood," Trundle.	23	30	9	32	14	60	168
Dubbo ...	Cullen Bros., "Bungle-gumbie," Dubbo.	23	32	8	33	10	60	166
Ariah Park ...	Mr. D. W. Edis, "Preston-ville," Ariah Park.	20	31	8	33	13	60	165
Canowindra ..	Messrs. E. M. Finn and T. G. Murray, "Benevento," Canowindra.	22	32	8	30	10	60	162
Boggabri ...	Mr. E. K. Vickery, "Nan-dewar," Boggabri.	23	27	7	27	13	59	156
Wee Waa ...	Mr. J. L. Schwager, "Car-donis," Wee Waa.	17	30	9	30	12	15	113

Much credit is due to Mr. K. Gault for his success in the championship. He has provided an excellent object lesson, demonstrating what can be done as regards fodder conservation on wheat farms in dry districts. The property is 1,061 acres in area, of which 300 acres are sown with wheat, 100 acres with oats as a green fodder crop, 10 acres are sown with lucerne, and it is intended

to fallow 200 acres. The balance of 551 acres is under natural pasture. The reserves of fodder consisted of ten small round stacks of cereal hay of a total weight of 142 tons, two of which were harvested from a self-sown crop of oats. Each stack was well built on timber dunnage, and protected from the ravages of mice by galvanised iron; and the whole were securely fenced against stock, and well separated as a safeguard against fire. A stack of 7 tons of lucerne hay was also built on dunnage, thatched with loose straw and fenced to keep stock away. In three pits were contained 293 tons of silage, made from a crop of wild oats, and 34 tons of wheat grain was stored in three galvanised iron tanks. The whole of the fodder was of good quality, and the total quantity was nearly double the stipulated requirements for the 580 sheep which was estimated to be the carrying capacity of the property.

The second prize was won by Messrs. Cullen Bros., who have been successful in winning two second prizes and one third in previous championships. Their property "Bunglegumbie," has a total area of 1,074 acres, and is situated on the Macquarie River, and has the advantage of river flats for the production of lucerne hay, which constituted the greater portion of the fodder reserves. Lucerne crops occupied 290 acres, cereal crops were sown on 365 acres, and the balance of 419 acres was utilised for grazing. A total of 492 tons of lucerne hay was contained in twenty-one stacks and two sheds, 179 tons of cereal hay in two stacks, one shed and a portion of another shed; a grain shed held 8 tons of chaff and 29 tons of oats and wheat grain, and all were of a high standard of quality. The total quantity of fodder was sufficient for feeding 2,698 sheep during a severe drought, or more than double the requirements based on the carrying capacity of the holding.

An outstanding feature was the excellent protection provided against deterioration of the fodder; the whole of the large number of stacks were very well built on dunnage of pine timber, and well thatched and securely fenced against stock. The greater portion of the cereal hay was stacked in a shed which was surrounded by a mouse-proof fence of galvanised iron, and the grain was stored in a mouse-proof shed which had a concrete floor 4 inches thick, with a skirting of 15 inches, into which the galvanised iron walls were sunk to a depth of 6 inches. Entrance by mice or rats was quite impossible, unless they were carried in with the grain or chaff.

Mr. D. W. Edis, the winner of the previous year's grand championship was awarded third prize. On his property of 820 acres, there are only 26 acres of pasture, and 20 acres are under lucerne; cereal crops have been sown to 440 acres, and it is intended to fallow 334 acres. The fodder reserve comprised 162 tons of silage of good quality, conserved in a well-crowned pit, of which about one-third was a mixture of oats and lucerne, one-third a mixture of oats and peas, and the balance wheat and wild oats; also, two well built and thatched stacks of oaten hay of good quality, aggregating 145 tons, one of which was built on a high stage—rendered mouse-proof with inverted petrol tins—and the other on a timber foundation, protected from

damage by mice with a galvanised iron fence, the joints of which were well capped; 50 tons of oats were stored safe from deterioration in a large galvanised iron grain silo. The quantity of fodder greatly exceeded requirements, but was lacking in protein for the feeding of a balanced ration.

Grand Championship of Inland Districts.

When a competitor has won two championship competitions, he is disqualified from participation in further championships, but is eligible to compete for a grand championship, with the winners of the championship competitions in each Division. This year the only challenger for the supreme honour of grand champion was Mr. G. F. Gray, of Wee Waa, who has previously won two championships in the North-west Division.

The awards made were as follows :—

Society.	Competitor.	Suitability and quality of fodder.		Location and protection.		Economy of protection.	Carrying capacity.	Total.
		(a)	(b)	(a)	(b)			
Trundle ...	Mr. K. Gault, "Lynwood," Trundle.	23	30	9	32	14	60	168
Wee Waa ...	Mr. G. F. Gray, "Hawthorne," Wee Waa.	17	31	9	32	12	56	157

The grand championship was thus won by Mr. Gault, with a comfortable margin of 11 points.

Mr. Gray's fodder reserves consisted solely of cereal hay, the bulk of it in bales, and all stored in four large hay sheds, being effectively protected from damage by weather, stock or mice, but the quantity was not quite sufficient for the feeding requirements of the stock which the property was capable of carrying.

General Comments.

In the report on the previous year's championship competitions, it was advised that as mice were increasing in numbers, precautions should be taken to prevent damage to cereal hay and grain. By the autumn, the number of mice in many inland districts had reached almost to plague proportions, and as the result of their ravages, much loss and damage was occasioned to cereal haystacks which were not protected against their inroads. The three prizewinners in this competition have demonstrated that by means of efficient protection, cereal hay can be stored throughout a mouse plague without incurring any depreciation. Both the elevated straddles and the galvanised iron fences proved very effective in preventing the entrance of mice into stacks, but vigilance is necessary to ensure that mice do not burrow underneath the fence, and that straws, sacks or other articles are not allowed to hang down

and permit the mice to climb into the stacks. The opinion has been expressed that hay in bales is not subject to damage by mice, but this has been proved to be erroneous; the mice are able to move in the space between the bales, and are able to gain entrance into the centre of a stack of baled hay with less difficulty than into a well built and well compacted stack of sheaf hay. The chief advantage of baling hay is that it can be transported with more facility when in bales, and occupies less shed-space—about two-thirds that of sheaf hay.

In view of the expense in protecting cereal hay from weather, mice, stock and fire, the question is raised whether it would not be wiser to conserve cereal crops that are intended for the feeding of sheep during drought periods, in the form of silage. This method is certainly more economical, for when the pit is filled and covered with earth, it is safe from deterioration, and no further outlay is required for its protection, nor is there the payment of insurance premiums. Only half of the competitors relied on silage as the basis of the fodder reserves, and more attention should be concentrated on the storing of cereal fodder underground in trench silos.

Many growths which are quite unsuitable for making hay can be converted into valuable fodder by this method. Last season there was a prolific growth of wild oats, self-grown wheat and herbage available in many districts for conserving as silage at the very small outlay for harvesting and pitting, but comparatively few availed themselves of the opportunity. The winner of this competition is one who had sufficient foresight to utilise a bulky growth of wild oats in this way, and filled three trench silos, containing close on 300 tons of silage. There is a probability that there will again be a luxuriant growth of a similar nature available this season for conversion into silage at very small cost, and it behoves stockowners generally not to allow this valuable fodder to waste.

It is interesting to note that more attention is now being given to the conservation of lucerne hay. It is the most valuable fodder available for feeding sheep, and owing to its high protein content, it combines admirably with cereal silage for the purpose of feeding a balanced ration. Lucerne is an adaptable crop, and although best results are obtained on river flats, still it can, with proper cultivation be grown successfully on a variety of soils, and when once established, is resistant to drought, and is the first growth to respond when rain falls after dry periods. Not only is it an excellent crop for grazing, but in favourable seasons good hay crops can be harvested. Lucerne hay is not subject to damage by mice and rats, but requires to be well protected from weather damage.

Oats grain is also excellent to conserve for feeding to sheep during drought periods, and it has been proved by competitors in this competition that grain can be stored in galvanised iron silos, safe from depreciation by mice or other pests.

Field Maize Championships, 1931-32.

L. S. HARRISON, Special Agricultural Instructor.

THE number of entries in maize competitions in 1931–32 was gratifying, and growers are to be commended for their appreciation of the educational advantages which these contests offer. Two societies, viz., Canowindra and Singleton, made their first appearance, and five district championship competitions were conducted by the Royal Agricultural Society with the same boundaries as last year. The yields throughout were estimated on the basis of dry shelled grain containing no more than 14 per cent. of moisture.

The New England and Inverell Championship.

Throughout the area covered by this competition, a season was experienced which presented some difficulty in the production of high yields, the rainfall

The Crop of Wellingrove which Won the New England Championship.

at the most critical period being very light. The winning crop, however, was very satisfactory in yield, and the cultivation methods adopted are worthy of close examination. The paddock is used alternately for maize, oats and grazing, which is conducive to good returns. New England growers are urged to adopt a rotational system, with the inclusion of grazing, since this offers the most satisfactory commercial method of cultivation and paddock utilisation.

It appears strange that there are still some growers who ignore the advantages of early ploughing, and there is also a tendency among some

New England growers, who alternate oats with maize, to neglect the latter crop when oat harvesting intervenes; this is unsound, and if it is considered unavoidable, then the area under cultivation should be reduced so that the crop may have the necessary seasonal attention.

Throughout this championship the standard of seed and its freedom from disease were quite good.

The results in this section were as follows:—

NEW ENGLAND and Inverell Maize Championship Results.

Competitor and Variety.	Cleanness of cultivation. (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c. (Max., 10 points.)	Freedom from pests and diseases. (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 5 bus.)	Total.
H. Simpson, Stonehenge, Glen Innes (Wellingrove)	18½	8½	9	8	11½	34½	90
A. J. Walsh, Dangarsleigh, Armidale (Wellingrove)	18	8	8	8½	12	28½	83
R. M. and H. F. Croft, Salisbury Court, Uralla (Large Goldmine)	17½	7½	8	8½	12	28½	82
D. and W. Rolph, Bungulla, Tenterfield (Hickory King)	18½	8	8	8	11	27	80½
A. J. Leese, Auburn Vale, Inverell (Funk's Ninety-Day)	18	8	9	8	11½	24	78½

Mr. H. Simpson, of Stonehenge, won this championship with a crop of Wellingrove grown on heavy black soil, typical of the district's best maize-growing soils and particularly suited to the Wellingrove variety. The land was first broken up twenty years ago, and last year did not carry a crop, oats having been grown the year before. It was first ploughed in May, harrowed and reploughed in August, harrowed and cultivated. Planting took place in mid-November in rows 3 feet 8 inches apart, three or four grains being planted every 3 feet 8 inches. After planting the crop was harrowed and cultivated four times.

Mr. A. J. Walsh, of Dangarsleigh, Armidale, won second prize with an entry of Wellingrove grown on a medium heavy black soil slope, which had been under cultivation for about twenty years, the competition crop being the second one of maize and following an oat crop. The plot was ploughed in September and harrowed, and the maize sown on 10th October with a double dropper, two grains every 3 feet in rows 3 feet 8 inches apart. After planting the crop was harrowed and scarified six times. The maize was very free of disease, and considering the season the yield was quite satisfactory. Mr. Walsh has achieved some success in seed selection with Wellingrove, which is a very useful variety for the heavy soils of the Armidale district.

Third place went to Messrs. R. M. and H. F. Croft for an entry of Large Goldmine of good type and uniformity, and showing a minimum of disease. It was the third crop of maize on a heavy black soil which had been under cultivation for sixty years.

The Tumut, Gundagai, and Canowindra Championship.

The rainfall records over the most important growing periods for maize in this area were unsatisfactory, but the yields obtained, particularly in the Gundagai section, were very good. The winner's area of typical Murrumbidgee alluvial promised to yield a crop of particular excellence. The points awarded for seed purity and type are a reflection of the knowledge and close attention applied to this aspect of the work.

The awards in this championship were as follows :—

TUMUT, Gundagai and Canowindra Championship Results.

Competitor and Variety.	Cleanness of cultivation (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c. (Max., 10 points.)	Freedom from pests and diseases. (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 5 bus.)	Total.
J. A. L. Thompson, South Gundagai, Gundagai (Funk's Yellow Dent)	18½	8½	9	8	12½	48	104½
J. T. Callaway, Gilmore, Tumut (Murrumbidgee White)	19½	8	8½	8	12½	39	95½
L. Payten and J. E. Mobbs, Bolabula, Canowindra (Funk's Yellow Dent)	17½	8	8½	8	12½	33	87½

Mr. J. A. L. Thompson, of Gundagai, won this championship with an entry of Funk's Yellow Dent on land that had been under cultivation for twelve years, the previous crop to the competition one being maize, the stalks of which were disced in, during September and the land then ploughed, harrowed, rolled and re-harrowed. Earlier ploughing was impossible because of heavy winter rains which provided sufficient subsoil moisture to carry the crops through an otherwise difficult summer.

The seed was planted in mid-October, three or four grains being dropped every 22 inches in rows 4 feet apart. The crop was harrowed twice and cultivated twice.

Mr. J. T. Callaway, of Gilmore, 16 miles from Tumut, won second prize with a crop of Murrumbidgee White, despite the worst seasonal conditions for maize experienced in Tumut for very many years. The land had not grown a crop for two years, though it had been under cultivation for twenty-five years. It was ploughed in August and planted with a two-row dropper

at the end of November, the rows being 3 feet 9 inches apart and three grains being dropped every 3 feet 6 inches. After planting the crop was scarified and hoed twice.

The entry of Messrs. L. Payten and J. E. Mobbs was of Funk's Yellow Dent, and was grown on Belabula River flat land that had been under lucerne for approximately fifty years. Farmers in this district are realising that maize is an excellent addition to their crops. The competition area was ploughed in September, harrowed, rolled, cultivated, harrowed and rolled. Planting took place at the end of October in rows 3 feet 4 inches apart, grains being dropped singly every 18 inches.

Early ploughing is essential in this district, and careful attention must be given to it.

The Crop of Murrumbidgee White entered from Tumut.

The North Coast Championship.

The area included in the North Coast division produces the bulk of the State's maize yield, and, while admitting that the year was far from being a good one for maize-growing, there should have been a much larger number of societies represented, for ample crops were available for competitive purposes.

In addition to those shown in the table of awards, Casino also organised a competition, but the weather prevented its continuation.

Except in the case of the winner, closer attention should be given to the seed type used.

The following were the awards made :—

NORTH COAST Maize Championship Results.

Competitor and Variety.	Cleanness of cultivation. (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c. (Max., 10 points.)	Freedom from pests and diseases. (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 10 bus.)	Total.
J. T. Pratt, Findon Creek, Kyogle (Fitzroy) ...	19	8½	9	8	12½	30	87
R. Hicks, Gordonville, Bellingen (Manning Silvermine)	18½	8½	9½	8½	11	27	83
W. H. Jarrett, Dorrigo (Grace's White) ...	18½	8	8	7	11	18	70½

The winner, Mr. J. T. Pratt of Kyogle, used land that had grown maize the previous year. It was ploughed in August, and harrowed, cultivated and rolled; reploughed in October, harrowed and disc cultivated; ploughed again in December and then harrowed. Floods covered the land in November. The seed was planted at the end of December in rows 4 feet apart, with two or three grains every 3 feet. After planting the land was scuffled twice and disc hilled. Superphosphate at 2 cwt. per acre was used.

The Central Coast Championship.

The support accorded this competition was not as strong as the importance of maize-growing within the area justifies, a number of districts which might reasonably have been expected to have had an entry not being represented. Singleton is to be congratulated on the high standard of its initial entry in the face of very dry conditions early in the season.

The awards in this competition were as follows :—

CENTRAL COAST Maize Championship Results.

Competitor and Variety.	Cleanness of cultivation. (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c. (Max., 10 points.)	Freedom from pests and diseases. (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 10 bus.)	Total.
E. H. McLeod, Mondrook, Taree (Giant White)	16	8	8	8½	11½	33	85
L. Greentree, Wilberforce (Leaming) ...	18	9	9	8	12½	27	83½
E. H. Ducat, Temagog (Fitzroy)	17	9	7½	5	12	30	80½
L. V. Holz, Mitchell's Flat, Singleton (Iowa Goldmine)	18½	8½	8½	9	12	19½	76

Mr. McLeod, of Taree, won the competition with a crop grown on land which received a heavy deposit of silt in 1929. It was ploughed in June, 1931, and cultivated four times before planting on 26th September. Superphosphate at 2 cwt. per acre was used. Adequate after-cultivation was given. Evenness of growth and uniformity of cobbing were features of this crop.

The crop awarded second place was also one of great merit. The land was ploughed in June, cultivated and reploughed; cultivated and planted in mid-September, 2 cwt. superphosphate per acre being used; then cultivated five times and lightly hilled.

The South Coast Championship.

This championship was a most satisfactory one. As many societies as could be expected submitted entries (the season was too dry for any from growers other than those situated on alluvial flats); yields were uniformly high; seed type was good (indicating care in selection); and the freedom from disease would be difficult to surpass—a reflection of effective control measures and a season which did not favour disease appearance.

The number of crops entered which followed lucerne showed that the growers have an appreciation of the advantages to be gained by having a leguminous crop in the rotation. To gain the greatest advantage from lucerne it is advisable to plough it in at least six months prior to maize planting.

The results are given in the following table :—

South Coast Maize Championship Results.

Competitor and Variety.	Cleanness of cultivation. (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c. (Max., 10 points.)	Freedom from pests and diseases. (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 10 bus.)	Total.
A. L. Mitchell, Lower Towamba, Eden (Leaming)	19	9½	9	9½	11	36	94
J. Bruchhauser, Camden (Fitzroy)	17½	9	9	8½	12½	36	92½
D. R. Gowing, Jellat Jellat, Bega (Funk's Yellow Dent)	19	9½	9	7	11½	36	92
H. O. Cox, Barrengarry, Kangaroo Valley (Pride of Hawkesbury)	19	9	9	8½	13	30	88½
H. Jeff-Bate, Bodalla (Hickory King) ...	19	9	9	8½	12	30	87½
A. Mottram, Numba, Nowra (Hickory King)	19	8	8	9	10½	33	87½
Haywood Bros., Pambula (Funk's Yellow Dent)	18	9	9	8	11½	30	85½
Bartlett Bros., Kiora, Moruya (Fitzroy) ...	17½	9½	9½	9	11½	27	84

Mr. A. L. Mitchell, who won this championship, used land that had been growing maize for about fifty years. Pigs were grazed on the previous crop.

The land was ploughed in August, rolled and harrowed several times and planted early in October in rows 3 feet 6 inches apart with three grains every 20 inches.

The points awarded for the seed would have been greater but for the fact that plants from self-sown grains of another variety were slightly in evidence. This rather unusual condition was brought about by the grazing of the previous crop by pigs, odd grains being trampled in and the plants being impossible of detection in the rows.

The crop of Fitzroy entered by Mr. J. Bruchhauser, of Camden, was awarded second place. It was grown on land which had been growing fruit trees for twenty years and was ploughed in July, rolled, disc cultivated, reploughed, harrowed, rolled and disc cultivated. Planting took place in November in rows 3 feet 8 inches apart, with two or three grains every 2 feet, superphosphate being applied at 3 cwt. per acre.

Mr. D. R. Gowing, of Jellat Jellat, who won third prize, used land which had grown two crops of maize, following lucerne for many years. It was ploughed in August, harrowed, sub-surface packed, reploughed, harrowed and again packed. Planting took place on 20th October in rows 3 feet 6 inches apart, seeds being dropped every foot. The variety was Funk's Yellow Dent, which has proved very suitable for many areas of South Coast alluvial soils.

Mr. H. O. Cox, of Barrengarry, Kangaroo Valley, entered a crop of Pride of Hawkesbury of particularly good type. It was grown on a medium heavy alluvial soil, and was the second crop after lucerne. First ploughing was given in June and the land harrowed and disc cultivated. Blood and bone at the rate of 1 cwt. per acre was applied two months prior to planting and the land then harrowed and reploughed. Planting took place early in October, with three grains every 27 inches in rows 3 feet 8 inches apart. After planting the land was cultivated three times and hand chipped.

To Poison Mice with Arsenic Water.

Mr. S. Wilson, of Lake Cowal Station, has forwarded the following recipe for poison water for mice. This mixture, it is claimed, has been used on the station for over forty years with much success. It is considerably weaker than the poison water generally recommended and contains no washing soda, points which are considered to make it more acceptable to the mice. Mr. Wilson points out that washing soda as an aid to dissolving the arsenic is not necessary if soft water is used, although essential when only spring water is available.

The directions are as follows:—

Boil in a 5-gallon drum 1 lb. commercial arsenic in 4 gallons soft water, no washing soda being required. Hang the drum up so that it boils from the bottom, otherwise the arsenic will not be completely dissolved. After boiling for about twenty minutes more water should be added to bring the quantity up to 4 gallons again. For use, 1 gallon of the mixture should be diluted with 20 gallons of water.

Production of Water Melon Seed.

Local Seed has Many Points in its Favour.

JOHN DOUGLASS, H.D.A., H.L.D., Agricultural Instructor.

A good deal of attention has recently been given to the saving of water melon seed. This has resulted partly from the economic conditions, but mainly from the bad results obtained from imported seed. In recent years heavy losses from fusarium wilt have been experienced in water melon crops. The available evidence shows that this trouble is seed borne, and has been introduced on imported seed. Again the imported strains of melons are not consistent in type or yield from year to year, with the result that losses are often experienced from this cause and growers are compelled to change the variety. That this is a State-wide experience is shown by the rapidity with which varieties go out of favour.

A Crop of Grey Monarch Water Melons.

There is no reason why the whole of the seed used in the State should not be grown here. At the present time the methods of saving and selecting the seed are very lax, with the result that the sample put up has not a very good appearance, but this can be overcome by a little extra attention.

Selection of Seed Plants.

It is almost impossible to go into an ordinary melon crop and make selections from individual plants, owing to the very tangled growth made by the vines. In commercial seed growing it is not necessary to make all individual selections, although the standard must be kept up by the grower

making individual selections for his own seed requirements. One method of growing melons that makes it practicable to pick out the individual plants is to plant a single row between rows of maize. After the seed germinates the hills are gone over and only one plant allowed to remain in each. It is then a comparatively simple matter to select the earliest-maturing, heaviest-yielding vines that are showing fruit of uniform quality and varietal characteristics. With an ordinary tangled crop the best means of selecting seed is to choose individual melons from that portion of the crop showing the greatest number of melons, paying particular attention to early maturity and other desirable features.

Saving the Seed.

The present methods of saving the seed are very crude, inefficient, and slow. The majority of growers who select the first ripe fruit naturally consume the fruit and save the seed. By this means a good sample of seed is obtained, although commercially the method is impracticable. Some growers allow the fruit to decay partly, then cut it open and more or less hand-pick the seed, cleaning it as well as possible and drying it on bags. The result of this process is usually a badly-stained sample showing a large amount of impurities in the form of dried flesh and skin. This method of extracting the seed might be all right on a small scale, although more attention should be given to cleaning.

On a commercial scale the seed melons are allowed to decay to an advanced stage, then opened with a knife, and the flesh, juice and seed removed. This mass is then crushed by any handy means until the whole is practically seed and liquid, and is then forced through a sieve that is small enough to prevent the seeds from getting through, although practically the whole of the flesh escapes. The seed is then thrown into buckets of water, thoroughly agitated, and the water then poured off—taking with it any floating tissue, etc., that may be present. This washing is repeated two or three times until the sample is perfectly clean, after which it is dried in the sun.

Seed Yields.

There has been a good deal of discussion as to the yield of seed to expect from a crop, but no definite data are available since there are no growers on a large scale who grow melons just for the seed; the usual practice being for growers to select the first early fruit for their own seed requirements, market as many of the remainder of the crop as possible, then save seed from those unsold.

The yield of seed varies with the variety and season. Mr. J. C. Rowcliff, of Dubbo, a pure-seed grower of the Angelo variety, estimates that each melon averages less than 1 oz. of seed, while on the Hunter, tests carried out with the Grey Monarch variety show that it takes between twelve and sixteen melons to produce one pound of seed. If the yield of melons was 300 dozen, each producing 1 oz. of seed, the acre yield of seed would work out at 225 lb.

If machinery was employed in the saving of this seed, the cost of the work could be greatly reduced.

Wild Ducks are Not a Serious Pest of Rice Crops.

J. R. KINGHORN, C.M.Z.S., Zoologist,* Australian Museum, Sydney.

DURING the years of 1926-27 and 1927-28, a severe drought was experienced throughout the State, and thousands of wild ducks and other waterfowl flocked to the Murrumbidgee Irrigation Area. Some rice growers, finding their crops far below normal in 1926-27, asserted that both the black duck and the grey teal ate the freshly sown seed and sprouting plants, puddled the bays (thus interfering with the young plants), and later destroyed the rice when it was in head. As the droughty conditions extended over practically two years many of the ducks settled down to breed on the Area, and as it appeared that they intended to make the swamps their permanent home, a move was made by some of the rice growers to have the names of several species of ducks removed from the list of protected birds.

As the area under rice was comparatively small in 1926-27 and the ducks unusually numerous it is quite probable that a certain amount of damage was done. However, some farmers were of the opinion that the ducks not only did very little damage to their rice, but that they destroyed large quantities of the barnyard grass, one of the worst pests with which the growers have to contend. In view of such contradictory evidence, and as there was no information available as to the economic value of wild ducks in regard to rice cultivation, the author was asked to investigate the matter.

At first an attempt was made to arrive at a conclusion by examining the stomach contents of ducks forwarded from the Area, but this method proved unsatisfactory, as it was evident that some of the ducks prior to being killed had been forcibly or purposely fed with mature rice grains. The crop of one bird forwarded was fully distended with mature rice grains, and this at a season when none of the rice crops on the Area had reached the mature stage. It was therefore decided to make a field inspection and investigation of the whole Area during the 1927-28 rice season.

The Field Investigations.

The first visit to the Area was made on 1st November, 1927, when it was decided to organise early morning shooting parties to secure ducks with full stomachs after feeding all night on the rice fields. These shoots were not at all successful, as the birds were very timid, but at Koonadan swamp three grey teal, one wood duck and one pink-eared duck (*Malacorhynchus membranaceus*) were secured. The latter feeds mainly on aquatic life and its

*This article is a summary of an extensive report by the author on the alleged damage by wild ducks to rice crops growing on the Murrumbidgee Irrigation Areas.

stomach contained the remains of insects and water weeds. From the others a quantity of rice seed, germinating rice, weed seeds and barnyard grass was obtained. As two of the specimens had gorged on rice some growers considered that the case against wild ducks had been proved, but although it established the fact that certain species will feed on rice, it did not prove that they were doing appreciable damage.

During this first visit some interesting observations were made in the Murrami district where the seed had just been sown and the water of the first irrigation was slowly creeping over the land. Here the starlings and crows were retreating before the advancing water, collecting worms and insects

Fig. 1.—Rice Bays Flooded for the First Watering.

It will be noticed that, through slightly uneven grading, there are several patches of land not covered by the water, and it is such patches that are open to attack by crows, galahs, starlings and other birds, a big percentage of seed being eaten. Furthermore, the seed in such areas does not germinate as well as that fully covered; in either case the result is a bare patch in the field at a later stage. Many settlers lay the blame entirely upon the duck.

which were wriggling hurriedly from the soil, but at the same time there appeared to be no doubt that they were also eating the freshly sown rice seed. Crows from nearby grassland were found to be full of caterpillars, while most of those from rice fields had eaten quite a lot of the grain. Others shot between rice and oat fields had preferred large black beetles and weevils.

It was agreed later that this first inspection was made about ten days too early, as about half the Area only was under water. However, it served to show that the intense concentration of ducks on the early sown and watered fields might do some damage, certainly more at this period than later on in the season.

At the time of my second visit to the Area (on 6th December, 1927) the rice was about 9 or 10 inches high and permanently under water to a depth averaging about 8 inches. During this period special attention was paid to the condition of the various crops, and observations made concerning portions which had been flooded, and possible causes of bare patches, these notes being handed to the field officers for checking up as the crops matured. Three grey teal which were collected early one morning and two late the same night on a block near Koonadan were full of green stuff which the grower asserted was young rice, but which was identified by a specialist as 20 per cent. rice and 80 per cent. barnyard grass, the latter eventually doing a lot of damage on that particular block by choking the young rice plants. Several

Fig. 2.—A Somewhat Bare Patch due to Faulty Grading.

The water lies in a depression, instead of draining off after the first watering, resulting in much of the seed being drowned. It is possible that ducks destroy some seed and plants in such areas by puddling, but, as one grower stated, such land is a loss in any case.

other ducks were secured at a third early morning shoot at Five Bough swamp, one grey teal and one black duck each having remains of rice in its stomach, while three other specimens were empty. This same day a run was made to the Griffith end of the Area, where some interesting data was collected from Mr. Kubank, who is perhaps the most outstanding experimenter, observer and grower in that district, and he declared that, although hundreds of ducks settled on his area by night and occasionally by day, no appreciable damage was done. He had gone into the question of whether broadcasting or drilling seed was the better, and had proved that seed that was broadcasted did not produce nearly such a heavy crop as that which was

drilled. It could be picked up by crows, starlings, sparrows, galahs and other birds long before it was covered by water, and the advancing water often carried the seed into depressions where it was drowned. Furthermore broadcasted seed did not make such a strong young plant and was liable to be puddled by ducks and other water birds during its early stages. Mr. Kubank also explained that he had carefully studied the many young plants often to be found floating along the edges of the check banks. Some growers stated that these plants were pulled up by the ducks, but Kubank showed that in one bay in which he had broadcasted seed young plants were washed up by wave action due to heavy winds. Later it was proved that in many instances where growers had claimed that the young floating plants had been puddled by ducks, the seed had been broadcasted and the plants affected by wind and wave action.

A Questionnnaire Sent to Growers.

After hearing many arguments by other growers, and discussing the matter with them, I was convinced that many of the statements made were the outcome of imagination and founded on hearsay, and furthermore some would contradict themselves when interviewed a second or third time. It was therefore decided to issue to growers the following questionnaire :—

1. Have ducks settled on your rice crop at any time this season ?
2. Approximately in what numbers ?
3. At what particular stage was the rice when the ducks were most numerous ?
4. Was the seed braodcasted or drilled ?
5. What was the approximate date of the first watering ?
6. Was the crop drained off after the first watering, or was it left flooded for any particular reason ?
7. Have the ducks done any appreciable damage to your crop this season ?
8. Has your crop been damaged by any other agent—say barnyard grass, or crows, starlings, galahs, &c., more than it has by ducks.

   Any general remarks in regard to ducks, rice, or rice pests of any kind may be made below. If you have more than one farm under rice give the registered numbers of those most affected.

About 150 questionnaires were sent out and 120 returned, on sixty-four of which it was stated that ducks did no damage, twenty-six could be classed as neutral, and thirty claimed that the ducks did appeciable damage. A close investigation of the latter showed that quite half of them were unreliable, some asserting that the duck was "the only bird" that damaged the rice, while crows fed only on insects and oats.

Reports of Damage Investigated.

During the last visit of inspection to the Area (March, 1928) particular attention was paid to the farms of growers who had reported adversely against the ducks, and observations were made as to the conditions under which the rice was grown. A few instances will serve to indicate the unsatisfactory nature of some of the replies. One particular grower reported that several acres had been completely eaten out by ducks and had to be partly re-sown two months after the first sowing. An inspection of his farm showed that all his rice was equally well advanced, whereas, if the particular bay mentioned had been re-sown, the rice at the time of inspection would have still been in the early milk stage. On the contrary, the whole crop was ready to be drained off prior to harvesting. A farmhand on the block, who did not know of the statement which had been made on the questionnaire, showed me a corner of one bay where he said the rice had been puddled and eaten by ducks. In this place the water, owing to faulty grading, was too deep to allow the ducks to puddle the rice, and there was no doubt that the seed had rotted or the young plants had been drowned.

Another grower stated that every morning he could have gathered a bag full of young rice plants that had been pulled out by the ducks. As the seed had mostly been broadcasted, the floating plants were probably washed up by wind and wave action. This grower, when interviewed, was willing to admit this, as he always found the seed attached to the young plants; whereas if the ducks had pulled it up some portion of it would have been eaten or broken.

Some of the growers stated that they watched the ducks pulling up the rice by night, but night shooting parties found it difficult to distinguish ducks from weed clumps and clods of earth, even at a short distance. It was also very noticeable that the growers who produced the best rice crops had little or nothing to say against the ducks, one in particular saying very definitely that his worst pest was the trespasser who trampled down his check banks when out after ducks, thus causing water to run off or get below the required level.

Conclusions Arrived At.

From these investigations it is evident that the black duck, grey teal and wood duck will eat rice seed, green rice plants, barnyard grass, weed seed and a few insects, while the pink-eared duck is valuable as an insect destroyer. Glossy ibis, cranes, herons, white ibis, spoonbills and other wading birds, being insectivorous, do a vast amount of good. Many of these birds also destroy myriads of young crayfish, thus preventing the crumbling away of check banks, drains, etc., due to the burrowing habits of these crustaceans. Native companions, if in sufficient numbers, could damage a rice crop badly by trampling, and there is evidence in one or two instances of damage having been done, but to what extent it was impossible to say. Crows are very

destructive to freshly sown rice, particularly broadcasted seed, the birds carefully retreating before the slowly advancing water, eating the grain as they go, though many insects forced up by the water are also devoured. On grassland it was proved by examination of stomachs, that crows eat vast quantities of caterpillars, grasshoppers and other insects. Galahs do inestimable damage by devouring the freshly sown rice, but their depredations cease as soon as the water is poured on. Starlings will eat rice which has been broadcasted, and will attack the heads when in the milk and mature stage. Against this, the starling devours myriads of grasshoppers and other kinds of insects. Sparrows appear to do most of their damage when the rice is mature.

While ducks will puddle freshly-sown rice the damage done to the crop in the aggregate is practically nil. Those patches where rice fails to germinate are seldom due to damage by ducks, but usually are to be found in the corners of bays and other depressions where the water will not drain off after the first watering, and the seed rots in the ground. Similar patches in the centre of rice bays have been traced to faulty farming methods resulting in bad grading of the surface. Ducks puddle some rice and pull up some, causing it to float on the surface, but in such cases some part, either the seed or stem, is missing, having been eaten. Usually, however, the floating plant is intact. In the case of broadcasted rice wind and wave action frequently cause plants to be washed to the surface.

In conclusion I have no hesitation in stating that under the present conditions, and so long as the same general conditions of rice growing prevail in the State of New South Wales, no appreciable damage will be done to crops by wild ducks. I cannot see that there is any need for alarm from the presence of flocks of ducks in the Irrigation Area in normal times, but in time of severe inland drought, damage might be caused by ducks as well as by many of the other kinds of birds which would congregate there in large numbers, and I have in mind the black moorhen, which is increasing greatly in numbers every year.

Acknowledgments.

Throughout the investigations I received much assistance from officials and growers on the Area. In particular I wish to thank Mr. Commissioner Seabrook, Mr. J. G. Youll (Manager of the Mirrool Area), Mr. Breakwell (then Principal of the Agricultural High School, Yanco), and Messrs. G. S. West and B. Martin, of the Commonwealth Research Bureau. To the President (Mr. G. Blencoe) and Council of the Rice Growers' Association, to Messrs. T. K. Coughlan and F. H. Barrett, Field Officers of the Commission, and to Mr. K. C. McKeown (then Economic Entomologist at Leeton) I am also greatly indebted. Mr. McKeown worked with me throughout the investigations, and carried on during my absence, and I feel that the observations set out in this article are his quite as much as they are mine.

Tobacco Notes for August.

C. J. TREGENNA, Tobacco Expert.

The Tobacco Seed-bed.

AUGUST is early enough to start sowing tobacco seed, and this should be continued at regular intervals of a week or ten days up to the first week in November, so that the grower may be assured of a sufficiency of plants whenever the weather is favourable for their removal to the field, after danger from frosts is past.

One hundred square feet of bed is sufficient for an acre, but the bed will require to be pulled over a period of a few weeks, and the grower should not miss an opportunity of getting out as many plants as possible at one time when the weather conditions are favourable. Then, too, the danger from loss of plants by destruction by insects and other causes must not be overlooked. The grower will find that, on the average, the provision of 50 per cent. extra seed-bed accommodation will amply repay him.

The site chosen for the seed-beds should be in a position sheltered from prevailing winds, and the soil should be a well-drained, rich, sandy loam. First mark off beds 4 feet wide, then pile a quantity of timber and brushwood on the surface, and start a fire on the leeward side, the intention being to raise sufficient heat to kill insect eggs and seeds of any weeds that may be present. Rubbish of any size should be raked off, but the fine ashes should be left, as these will act as a fertiliser when worked into the bed. Then the surface should be broken to a depth of 5 or 6 inches, and worked up to as fine a tilth as possible.

If it is desired to obtain plants quickly, lightly cover the whole bed (so that it may be plainly seen) with high-grade superphosphate before sowing; about 3 or 4 lb. will be required for each 100 square feet of seed-bed. Take a rake and *lightly* draw it over the bed once. Plants cannot be obtained quickly, however, if the ground is not warm and the weather spring-like.

Seed-bed Frames.

The seed-bed should be enclosed with a framework of wood, which can be roofed over with cloth. If squared timber is not available, straight round timber about 6 to 9 inches in diameter will answer the purpose.

Successful control of the blue mould disease in the seed-bed has been obtained by the use of artificially-heated frames, which also allow the amount of water supplied to be regulated. Such a frame should be made of brick, concrete, or pisé, and a useful size is 20 feet long, 6 feet wide with the walls 3 feet high at the back and 2 feet at the front. It is covered with sliding sashes of glass or oiled calico. A fire-grate is provided at one end, and two 4-inch pipes are carried from the grate through the frame. Sand is placed in the bottom for drainage, and 6 to 8 inches of good soil on the sand for the seed-bed.

Sowing the Seed.

One level teaspoon of seed is sufficient for a bed 4 feet wide and 25 feet long, and should yield enough plants for one acre. To ensure even distribution, the seed should not be sown without addition to its bulk. A simple method is to use two buckets, one of which should be about one-third filled with fine ashes. Place a thin layer of ashes in the empty bucket, and sprinkle as evenly as possible a pinch of seed over it; add another layer of ashes and mix well. Repeat the process until the quantity of seed it is desired to sow is used up, together with the ashes, and then mix again with the hands.

The early morning will probably be found the best time to sow the seed, before the wind becomes troublesome. It is inadvisable to sow with a strong wind prevailing, if it can possibly be avoided, as the seed is so light that it will be blown away. The mixture of ashes and seed should be distributed over the bed as evenly as possible; the colour will be found a guide as to evenness. The seed should not be raked in, but after sowing the bed should be gently firmed all over with a piece of flat board. Then lightly water the bed several times with a can that has a fine rose. Do not put on so much at one time that it will run in a small stream, but moisten the bed thoroughly.

If the soil is inclined to pack after sowing, scatter over the bed very lightly some fine, well-rotted horse manure. If it is anticipated that the soil is likely to pack in this way, the manure should be incorporated in the bed before sowing.

Wellingrove and Fitzroy Seed Maize Contests.

Continuing the practice of previous years, seed maize yield contests with Wellingrove and Fitzroy varieties will again be held at the New England (Glen Innes) and Grafton experiment farms. Entries close on 1st October and 1st November, respectively, and those who intend competing should send along to the manager of the farm concerned a 5 lb. sample of the seed they wish to enter. These samples will be grown under uniform conditions, and a certificate will be awarded the owner of the highest yielding sample at each farm. The Department, of course, reserves the right to limit the number of entries and to reject any samples not sufficiently pure or true to type.

These tests offer excellent opportunities for farmers who have devoted much attention to seed selection and who wish to demonstrate the excellence of their particular strains. Previous tests along these lines have been very successful, and have created a demand for seed of the best strains entered.

Samples of Fitzroy should be sent to the Manager, Experiment Farm, Grafton, and of Wellingrove to the Manager, New England Experiment Farm, Glen Innes. For further information apply to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Investigations on Two White Wax Scales (*Ceroplastes*) as Pests in Australia.

E. H. ZECK, Assistant Entomologist.

THE chief point of interest in the following article is that it records for the first time that the common White Wax scale pest of our citrus orchards is an African species *Ceroplastes destructor*, and not the Indian White Wax scale, *Ceroplastes ceriferus*, which latter was formerly considered to be the species infesting citrus trees and the native "blackthorn" here. *C. ceriferus* is found on a comparatively limited number of garden plants and native shrubs. Preliminary lists of hosts of each species are set down here, as well as descriptions and figures illustrating the structure and features characterising the waxy tests, the adults and larval stages of these insects, so that those interested may recognise the two species.

In 1928, Mr. W. B. Gurney, Entomologist of the Department, visited the Imperial Institute of Entomology in London to inquire concerning parasites for White Wax scale which might be introduced into New South Wales to control this pest. As a result specimens of White Wax scale on pittosporum were submitted to Mr. F. Laing, of the British Museum. Mr. Laing kindly determined this species, and reported that the specimens submitted were *Ceroplastes destructor*, and for this we have to express our indebtedness. The Entomologist later arranged for the author to undertake investigations on the development of White Wax scale, and to carry out further work with a view to improving on the present method of control, though it was (and is) considered that the washing soda spray recommended by the Department will readily control the wax scale, if applied early enough, that is, while the scale is in its early stages, though not so satisfactorily when the scales are well developed.

As it was the opinion of some growers that they were not obtaining adequate control, the Entomologist instructed me to commence laboratory and field experiments with various chemicals for the control of the wax scale, and also to make a study of its life history. In connection with this latter phase of my inquiries, microscopic examinations of specimens and comparisons of these with Newstead's, Maskell's and Green's descriptions were made. Though my specimens of *C. ceriferus* agreed with the characters given by Maskell and Green, those of *C. destructor* did not agree with the characters given by Newstead, in that he stated that no sub-marginal tubercles are present in the adult females. But having the advantage of unlimited supplies of fresh material for examination, the sub-marginal tubercles were certainly found to be present in all the specimens examined. It seems possible therefore, that further examination of *C. destructor* in Africa will show that these sub-marginal tubercles are present; otherwise, the specimens from

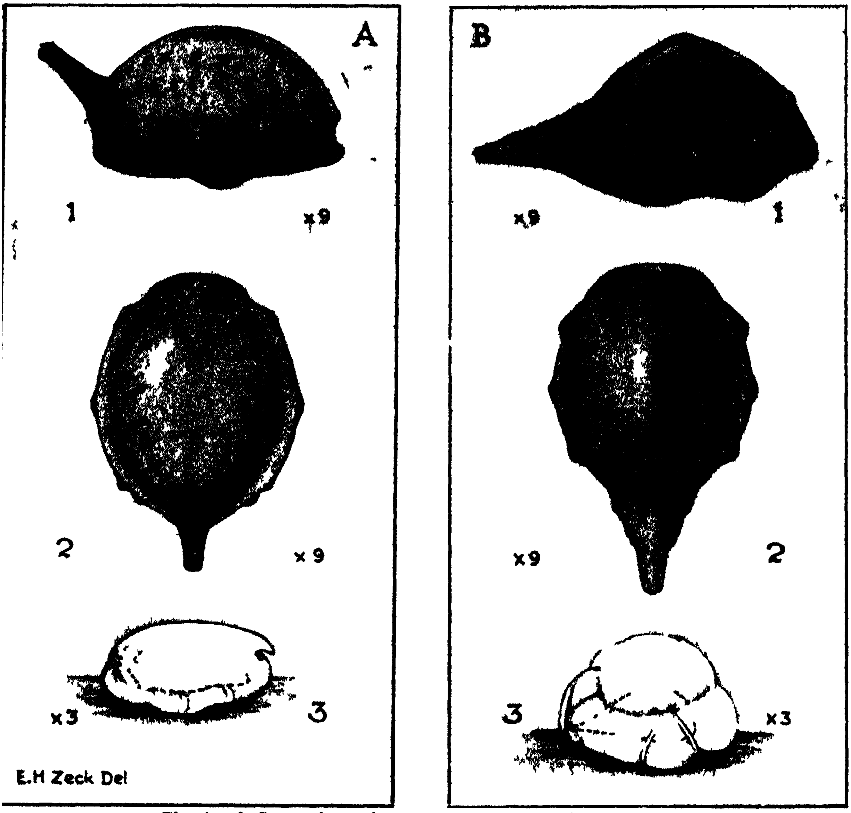


Fig 1.—A Comparison of the Adult Females and Waxy Tests.

A.—*Ceroplastes ceriferus* Anderson.
1.—Body of adult female, lateral view.
2.— „ „ dorsal view.
3.—Test of adult female (the dotted line indicates the position of the body).

B.—*Ceroplastes destructor* Newstead.
1.—Body of adult female, lateral view.
2.— „ „ dorsal view.
3.—Test of adult female (the dotted line indicates the position of the body).

Fig. 2.—The Two Species of White Wax Scales.

A4.—*Ceroplastes ceriferus*, adult and immature females, natural size.
B4.—*Ceroplastes destructor*, adult and immature females, natural size.

Australia determined by Laing as *C. destructor* may prove to be an allied species. The tubercles are not so readily seen in microscopic mounts as in fresh specimens, and may have been overlooked.

The Distribution of the Two Species in Australia.

After examining various specimens in the collection of the Entomological Branch, the writer is of opinion that *C. destructor* has frequently, in the past, been erroneously considered to be *C. ceriferus*. Thus specimens on persimmon collected in 1910, and labelled *C. ceriferus*, were definitely found to be *C. destructor*, nevertheless *C. ceriferus*, probably introduced from Asia, is present here on a limited number of hosts, and both this species and the African species, *C. destructor*, have apparently been introduced into Australia as far back as forty years ago or more.

Again, after examining illustrations of White Wax scale figured by Messrs. Newman, O'Connor and Andrewartha*, it seems probable that *C. destructor* and not *C. ceriferus* is infesting orchards in Western Australia also.

It may be said, therefore, that though *C. ceriferus* occurs in New South Wales, Queensland and Western Australia, it only infests a few garden plants and native schrubs, while *C. destructor*, the African species, is the pest of our citrus trees, and also attacks quite a large series of native and introduced plants, including the native "blackthorn."

The two species of White Wax scales may be determined in the field by reference to the following characters:—

Indian White Wax Scale (*Ceroplastes ceriferus*).	African White Wax Scale. (*Ceroplastes destructor*).
Waxy covering of female with a short, downwardly pointed, "horn" at one end (anterior).	Waxy covering of female without a "horn."
Abdomen of female when denuded of wax with a conspicuous raised "tail." (See Fig. 1, A1 and A3.)	Abdomen of female when denuded of wax with the "tail" lying flat on bark. (See Fig. 1, B1 and B3.)

The Indian White Wax Scale (*Ceroplastes ceriferus*).

This scale was first described by Anderson in 1791 (*Mon. Cocci ceriferi.*, Madras), from India.

In 1893 Maskell first recorded this species in Australia from specimens forwarded to him by Kolbele and Olliff, and it is assumed that Olliff forwarded his from New South Wales. The next record of its presence in New South Wales was made by F. oggatt in 1897.

Female Test **(Fig. 1, A3 and Fig. 2, A4).**—The waxy test of the adult female is creamy white or white, and is almost one-third of an inch in length and one-fifth of an inch in height. Its form is more or less smooth and regular. In

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*** Journal of the Department of Agriculture, Western Australia, December, 1929.**

front there is a downwardly-curved waxy process or "horn." Behind, where the anal aperture opens, is a minute black spot about half way up the hind surface of the test. In a heavy infestation the waxy tests merge and may become agglomerated.

Two narrow, opaque white bands of waxy material are present on each side of the test. These extend from the two pairs of stigmata or breathing pores situated on the under surface of the body of the insect. These bands, which pass along the stigmatic grooves, may serve as a passage way for the air, and to prevent the wax of the test from blocking the grooves.

Adult Female (Fig. 1, A1 and A2).—The body of the adult female inside the waxy test is about one-fifth of an inch in length, but smaller specimens than this have been observed to cover numbers of eggs. Seen from above, the body is elliptical, and bears posteriorly a conspicuous caudal process or "tail," which is brown to black in colour. The body is shiny and varies in colour from orange to red or brown.

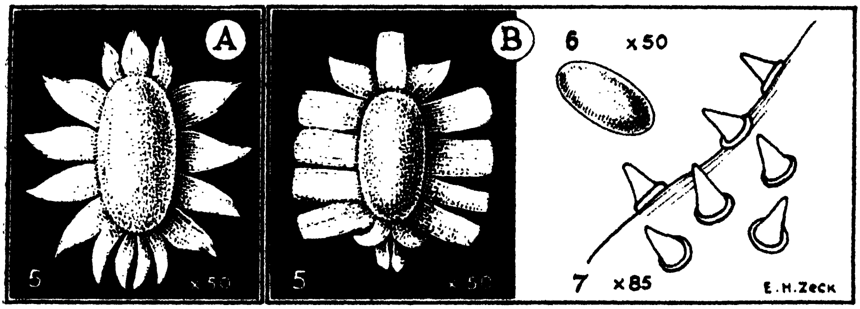

Fig. 3.—Young White Wax Scales and Other Details.

A5.—Larva of *Ceroplastes ceriferus*.
B5.—Larva of *C. destructor*.
B6.—Egg of *C. destructor*.
B7.—Stigmatic spines of adult female of *C. destructor*.

There are nine sub-marginal tubercles, one in front and four on each side (the hinder two being close together). The caudal process is heavily chitinized and bears at its tip the anal operculum with two rounded valves. This "tail" process projects upwardly, at an angle of about forty-five degrees, from the middle of the hind end of the body. This scale has three pairs of minute legs, a pair of six-segmented antennae, a sucking beak, and two pairs of stigmata or breathing pores on the under surface of the body. Minute wax secreting glands are scattered over the body.

Eggs.—The eggs are pinkish in colour and ellipsoidal in form, and about one-eightieth of an inch in length.

Larva (Fig. 3, A5).—The young larva is at first active, without covering, and about one-seventieth of an inch in length. The wax first forms as a series of sub-marginal rays or pointed processes, fifteen in number, around the body, and a wax pad develops on the upper surface. Later the wax covers

the body, and the test becomes conical; the waxy cone gradually bends forward, and by the time the larva becomes adult the cone forms the characteristic downwardly-curved wax "horn." The sub-marginal rays of the larval test of this species are more sharply pointed and definitely distinct from the truncate rays of the larval test of *C. destructor* (see Fig. 3, A5 and B5).

Adult Male.—The male has been recorded in India.

Host Plants in New South Wales.

This scale has been found infesting the following plants :—*Alsophila* (tree fern), *Aster ramulosa*, chryanthemum, *Dodonaea triquetra* (native "flax"), michaelmas daisies, perennial phlox, *Leptomeria acida* (native currant). *Polygonum nodosum*, *Polystichum* sp. (fern).

The African White Wax Scale (*Ceroplastes destructor*).

This scale was first described by Newstead in 1917 (*Bul. Ent. Research*, VIII, p. 26) from Uganda, where it was found infesting coffee, cacao, agave, canna, croton, hibiscus, etc.

Female Test (Fig. 1, B3 and Fig. 2, B4).—The adult female test is white or very slightly greyish, and softer than that of *C. ceriferus*. Its form is irregular, with large, rounded protuberances, and without the curved waxy process or "horn" in front, and is a little more than three-eighths of an inch in length, and a third of an inch in height. The anal aperture opens in a slight posterior depression low down on the test close to the bark, and not halfway up the test as in *C. ceriferus*.

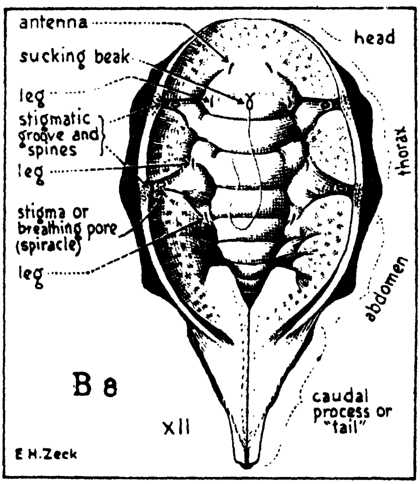

Fig. 4.—Body of Adult Female of *Ceroplastes destructor*, seen from Below.

The tests of the coccids are frequently so numerous that they become more agglomerated than in the preceding species. The two pairs of narrow, opaque white lines which extend along the stigmatic clefts are also present in this species.

Adult Female (Fig. 1, B1 and B2).—The body of the adult female measures about one-fifth of an inch in length, and seen from above is elliptical, and bears posteriorly the caudal process or "tail," which tapers irregularly to a bluntly rounded point. The body is shiny and varies in colour from light red to dark brown. The caudal process is usually lighter in colour than the body, and the anal operculum bears the two short valves or lobes. This caudal process lies flat upon the surface of the bark.

There are seven sub-marginal tubercles, one in front, and three on each side, of which the anterior lateral pair is sometimes sub-divided. (Newstead in his description states that all these tubercles are absent.)

Six minute legs, a pair of six-segmented antennae, a sucking beak and two pairs of breathing pores are present on the lower surface (see Fig. 4). Minute wax secreting glands are scattered over the surface of the body.

Egg (Fig. 3, B6).—The egg measures about one-eightieth of an inch in length, is reddish and ellipsoidal.

Larva (Fig. 3, B5).—The young larva is at first active, and without covering, and is about one-seventieth of an inch in length. It soon develops a series of fifteen waxy sub-marginal rays, three in front, four behind, and four lateral pairs which are truncate. A wax pad develops on the upper surface of the body.

The further secretion of wax in many young forms gives a resemblance to the conical formation seen in the young of the *C. ceriferus*; but this does not persist.

Adult Male.—The male has been recorded in Africa.

Host Plants in New South Wales.

Atalantia monophylla, *Bursaria spinosa* (native "blackthorn"), *Celastrus Cunninghamii*, *Chamaelaucium uncinatum*, *Citrus* spp. (oranges, lemons, mandarins, grape fruit), *Erigeron* sp. (cobbler's peg), *Escallonia frethyii*, *Eugenia aquae*, *E. coolminiana*, *E. regeliana* (lillipillies), *Euonymus amurensis*, *Gardenia florida*, *Helichrysum diosmifolium*, *Loranthus* sp. (mistletoe), *Mitriostigma axillaris*, *Diospyros* sp. (persimmon), *Pittosporum crassifolium*, *P. tobira*, *P. undulata*, *Podocarpus spinulosa*, *Randia stipulosa*, *Ligustrum* sp. (privet).

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"Sprung" and "Shot" Wheat Defined.

Addressing the Nelungaloo Branch of the Agricultural Bureau, Mr. H. Bartlett, Senior Agricultural Instructor, explained that wheat was "sprung" when germination had commenced and the germ was swollen but had not broken the skin, and that it was "shot" when the skin was broken.

Citrus Production Records.

R. J. BENTON, Special Agricultural Instructor.

The dairy farmer has learned that it pays to cull out of his herd all cows whose production falls below that of a recognised profitable standard, and the time is fast approaching when the orchardist will be forced to realise that it is only profitable to grow fruit trees than can be relied upon to produce consistently high yields of good quality fruit.

The modern dairy farmer culls his herd by the aid of his herd production records, which not only inform him as to the yield of each of his cows, but also of the seasonal conditions and the feed supplied, enabling their influence on the milk yield to be considered.

The influence of the buds used—the inherent capacity is governed by the bud—and of the effect of seasonal conditions and of cultural and manurial practices on his trees may similarly be determined by the citrus grower by keeping production records.

To enable Departmental citrus bud selection work to be continued from trees with definitely recorded performances, fruit inspectors in the citrus growing districts have made numerous tree records in many localities during the past four years. The method adopted in this work has been for the inspector to select plots of trees of different varieties which are apparently of the best strain of those varieties, and to estimate as closely as possible the annual production, both in bushels and percentage of tree carrying capacity, noting at the same time any peculiarities of mutation or variation. An estimate, rather than an actual yield, is taken, because of the time required for the latter.

Many records of four years' performance are now available, and these have resulted in the discarding of a number of trees from future observation, since the records to date have shown that the production for various reasons is not, either in quantity or quality, equal to that of other trees.

Some years ago it was suggested to citrus growers that each should record the performance of his trees. This work may be done rapidly just prior to harvesting, and is of great value in indicating which trees are paying their share of the production costs. Very few growers adopted the suggestion, and many rather ridiculed it, believing that trees that failed to bear well one season made up for it the following year. Their action is akin to that of some nurserymen who do not see the need for special care in the selection of bud wood, or to that of a manufacturer who flouts costing charges. A record of the production of citrus trees is a valuable guide as to unproductive trees, and if the record is read intelligently it may suggest remedies, which if applied, may reduce the cost of production.

The following records, taken from Mr. Inspector M. Byrne's book, are typical of many others, and illustrate the value of the recording work being done. Seven plots of Valencia Late oranges were selected in five orchards along the Hawkesbury River. Two plots were ten years old, and the other five were fourteen years old in 1928, when the records were commenced. The following table shows the number of trees which produced various crops percentages in these seven plots.

AVERAGE Crop percentages.

Average Crop percentage over four years.	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.	Plot 7.
	No. of Trees.	No. of Trees.	No. of Trees.	No. of Trees.	No. of Trees.	No. of Trees.	No. of Trees.
Over 70	Nil.	1	12	Nil.	2	1	1
60—70	7	26	15	Nil.	9	5	10
50—59	28	54	7	4	7	20	12
40—49	25	9	5	13	1	18	16
30—39	5	2	Nil.	5	1	5	7
20—29	1	Nil.	Nil.	Nil.	Nil.	1	3

Though the figures in this table indicate great variation in yield, it is desired to stress the fact that no trees in Plots 1 and 4 averaged 70 per cent. of a crop over the four years, and that the production throughout those plots was low.

It may be accepted that trees which produce an average of less than half a crop over four years are of doubtful profit-earning capacity. The following table indicates that the plots produced as follows:—

PERCENTAGE of Trees averaging over and under 50 per cent. of a crop.

	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.	Plot 7.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Over 50 per cent. ...	53	88	87	18	90	52	47
Under 50 per cent. ...	47	12	13	82	10	48	53

Obviously in Plots 1, 4, 6 and 7 there is great need for improvement in the production standard, and Plots 2, 3 and 5 might be still further improved by reducing the 12, 13 and 10 per cent. respectively of trees which averaged less than half a crop each year. The factors causing these varying yields are being investigated.

All the trees are in reasonably good land, and since the trees bearing average yields of less than 50 per cent. are distributed over the areas in Plots 1, 4 and 7 it would appear that in these cases faulty cultural practices and lack of

manuring are responsible for the low yields of the plots. In the case of Plot 6, the twenty-four trees producing less than 50 per cent. have the following tree numbers in the rows:—

2;
1 to 5, 10 to 13;
2, 3, 4, 6, 7, 8;
1, 7 to 13.

The distribution of these trees over the four rows in this case does not so much indicate cultural or manurial neglect as probably an inferior strain of tree, for so many of the inferior trees are consecutive numbers or nearly so, indicating that they were planted from bundles of trees largely propagated from inferior parent plants, and only slightly separated on planting. Where this is the case reworking to a better strain is the only recourse. In the absence of a better source of budwood—and environmental factors would make such a source unlikely—this grower is directed by the plot record to tree No. 6 in Row 1, which has produced an average of 72·5 per cent. of a crop each year for four years, the quality of the fruit being regularly recorded as good, and to several other trees which have been proved by the records to have desirable qualities and production ability.

The detection of trees of inferior strain, while a very important use of tree records, is not the only way in which they are of value when kept over a period of, say, four years. Records such as those typified above may also indicate several other matters of interest to growers, such as inefficient cultural and manurial practices, while in irrigation areas, particularly where seepage, salt effect, or inefficient irrigation may not be suspected, the record can be of especial value.

How to Preserve Fresh Persimmons.

The best method of preservation of fresh persimmons, states Prof. W. V. Cruess in the *Pacific Rural Press*, is to pack them in wrapped form in one layer flats and store them at from 32 to 36 deg. Fahr. in the same way that apples are held in cold storage. The persimmons, however, must not be over-ripe, otherwise they will soften and spoil.

If they have already become ripe, the best method of preserving them is to peel them and pack them in a solid pack in 1-gallon or 5-gallon enamel-lined friction-top egg cans, together with about 1 lb. of sugar to each 4 lb. of fruit, well mixed in. Store at not above 15 deg. C. in frozen condition.

This fruit is excellent for serving as a breakfast dish or for use in ice cream. In my estimation, persimmon ice cream is the best ice cream that can be made. About 20 per cent. by weight of the persimmon pulp should be used in the cream.

Another method of preserving persimmons is to peel them, cut them in half, and dehydrate them at a temperature not above 150 deg. Fahr. Perhaps the Japanese and Chinese would buy them, as they import large quantities of this product from the Orient.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6,200
Swane Bros.	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

—C. G. Savage, Director of Fruit Culture.

Quality is the Factor that Sells Your Oranges.

"Advertising your products may be all right if you can supply the goods," said Mr. W. Barrett, of Dooralong, at a recent Agricultural Bureau Conference, "but there is no one more disappointed than the consumer, who is persuaded to purchase and then finds that the article he buys does not come up to expectations. I do not agree with the contention that appearance in oranges is everything. Appearance may make a first sale, but repeat sales are made on eating quality, as, after all, the consumer, who is the person we have to consider, only buys to eat, and we want him not merely to consume one orange, but to keep on eating them. Supply an article which the public wants and our trouble of under-consumption will soon be over."

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That nearly two thousand copies have been sold annually since it was first offered to the fruit-growing community is some index to its reputation as a guide. Each fruit, it must be remembered, has its individuality, and the habits of each must be closely studied. The Apricot, Peach, Nectarine, Plum, Apple, Pear, Cherry, Almond, Persimmon, Passion Vine, Loquat, Quince, and Fig are all fully dealt with, and with the aid of illustrations, which are an important feature of the publication, the grower is informed how to obtain from his trees consistently profitable returns.

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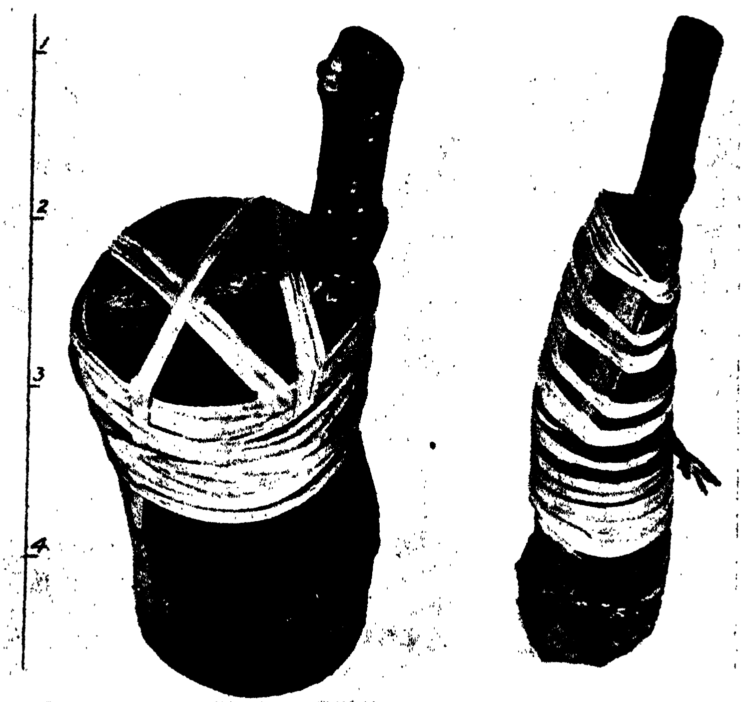
Orchard Notes.

AUGUST.

C. G. SAVAGE AND H. BROADFOOT.

Grafting.

THE grower who has any unprofitable trees should now consider the grafting on to them of better varieties, the second half of August being a suitable time for this operation. Obviously, only highly productive trees of first quality fruit should be chosen as sources of grafting wood if the operation is to be beneficial.



Strap-grafting.
Scions tied and ready for either waxing or claying.

Of the different methods of grafting, whip grafting is most favoured for small stock. Cleft grafting is sometimes used for working over old fruit trees, particularly pears, apples, plums, etc. Strap grafting, another method of bark grafting, may be used for working over small to medium sized trees. This type of graft is shown in the accompanying illustration. The scion,

it will be seen, is thrust down between the bark and the wood to be grafted, and a strip of bark, supported by a strip of sapwood, is carried across the top of the limb and inserted under the bark on the opposite side. The whole is then tied and covered with grafting wax or clay in order to ex' 'ide the air and prevent the cuts from 'ying before the union is effected.

A satisfactory grafting wax can be made up of 4 lb. resin, 2 lb. beeswax, and 1 lb. mutton tallow. These ingredients are dissolved over a slow fire, and the wax is applied while warm with a small brush. Another formula is 1 lb. beeswax, 5 lb. resin, and 1¾ lb. boiled linseed oil.

For details of the processes of budding and grafting of fruit trees, readers are referred to Farmers' Bulletin No. 63 (Orchard Nursery Work: Budding and Grafting), which is obtainable from the Department, price 10d. (postage included).

Pollinators for Fruit Trees.

Mention of grafting suggests also the advisability, where provision for pollination seems insufficient, of re-working certain trees to more suitable varieties. Most growers appreciate the value of making adequate provision for cross-fertilisation, but there are still many blocks of the same varieties of trees, the production of which, though fair, would be increased if suitable pollinators were supplied. In these cases pollinators may be grafted upon the limbs of trees at suitable intervals throughout the block, or the whole of individual trees may be suitably grafted. If the latter method be adopted, the limbs should be cut not too close to the crown. When grafting old trees it is better to insert the grafts fairly high up on the limbs. On old trees when limbs are cut too near the crown a big surface is exposed which very often does not heal and the limbs die.

Working individual limbs is very satisfactory when the work is carried out in a skilful manner, but in this case, too, high working of the limb is necessary—even higher working than when the whole tree is re-worked. If a limb is grafted low down, the old-established limbs will shade and rob the graft, and thus reduce its chances of making satisfactory growth. Very frequently, pollinators worked in this way make little growth, even over a period of years. They just maintain a miserable ineffective existence. Even when the graft is inserted high up upon the limb, care should be taken to prevent its being sapped by growths from the limb upon which it was grafted. It cannot be too strongly stressed that to obtain the best results high working on an outside limb is necessary, as only by this method will sap be plentifully supplied and development follow.

A small twig, buried in a big tree and struggling for existence, just managing to produce a few blossoms, is of no use as a pollinator. A strongly-developed limb that will carry many blossoms should be encouraged. A good plan for the first few years, or until the graft has sufficiently

developed, is to pull the fruit from the pollinator after setting. This not only helps in the development of a good limb, but ensures a supply of blossoms every year. Frequently in the case of a graft which has developed moderately well (worse still, of course, when development is weak), development is seriously impeded if it bears much fruit, with consequent depreciation of its value as a pollinator.

The subject of cross-pollination of fruit trees is discussed at length in a pamphlet obtainable free on application to the Department.

Pruning.

This operation may be continued during the current month on all kinds and varieties of deciduous fruit trees that have not made the first signs of growth. This applies particularly to pome fruit in late tableland districts.

In the case of young trees the establishment of a good framework is of great importance. The limbs should not be allowed to outgrow their strength or to commence cropping before they are strong enough to bear the weight of fruit—a small immediate profit should not be sought at the cost of the strength and vitality of the tree. In the case of older bearing trees the characteristics of each variety should be studied, and it should be remembered that each tree of the same variety also has an individuality. Only by paying close attention to such individuality can the best results be obtained.

Pests and Diseases.

Sane José Scale.—A strict watch should be kept for this pest. The most effective means of control is to spray, just before the buds commence to swell, with miscible red oil (1-20).

Leaf Curl.—As pointed out in recent notes, leaf curl in peach trees can be effectively controlled by spraying, provided the application is made while the trees are still dormant, just before the buds swell. Peach trees that have not yet been sprayed and have not commenced to shoot should receive an application of winter strength lime-sulphur or Bordeaux mixture (6-4-40). The protection given will be in proportion to the thoroughness of the application.

Powdery Mildew.—If the precaution is taken during the pruning of apple trees to remove, as far as possible, all twigs affected with powdery mildew, the incidence of this disease will be considerably reduced. Their removal should be followed by spraying with colloidal, atomic, or atomised sulphur, or with lime-sulphur.

Prevention of Mould Growth in Cool Stores.

Mould growth is sometimes troublesome in cool stores, especially where temperature and humidity are high. A mixture which it is claimed will act as a deterrent, states Mr. W. A. Birmingham, Assistant Biologist, is

composed of 1 gallon limewash made up to the consistency of milk, 1 cupful plaster of paris, and 6 fluid oz. commercial formalin (40 per cent. formaldehyde).

Treatment of "Staggy" Trees.

The almost total failure of the apple crop and to a lesser extent of the pear crop, heavy as were the losses to orchardists, has in many instances been of considerable benefit to the trees, points out Mr. W. W. Cooke, Fruit Instructor. In numerous orchards, especially where the soil is of a light and sandy nature, trees of different varieties are to be found which have failed to make any new growth for a number of years, the terminals of the leaders consisting of spurs only. These "staggy" trees, as they are often called, have always presented a problem to orchardists, and especially to those who cannot obtain a supply of some organic manure. To cut back a foot or two into old wood at the winter pruning rarely, if ever, gives satisfactory results, and cases may be quoted where trees have been treated in this way for several years in succession, and have each year failed to respond, the owner eventually grubbing them out, the trees having become little more than stumps.

Good results in the rejuvenation of staggy trees have often been obtained by a judicious thinning out of such limbs as can be spared, as well as a heavy reduction of the number of blossom buds, in conjunction with the ploughing under of some organic or green manure in July, this treatment being followed by good cultivation during the growing period. For the past two or three years in several orchards visited by him regularly, states Mr. Cooke, the owners have been endeavouring by careful pruning, thorough cultivation, and other measures to induce new growth in trees of the type under discussion, but the results until this season have not been very satisfactory, one of the troubles in the past having been that the trees, in spite of careful bud pruning, had carried too much fruit to allow of new leader growth being produced. This year, in several cases under observation, no fruit at all set on trees of this class, owing no doubt to the ravages of thrips. In such cases, provided the trees received proper attention, the results have been surprising, and very gratifying despite the failure of the crop, new growth having been made more or less throughout the trees. If from now on such trees are given correct treatment, the new growth being cut back fairly hard in the winter to good wood buds, so as to stimulate further growth, followed by proper cultural methods, and care is taken not to allow the trees to over-produce, they may be considered to be well on the way to becoming profitable again. In several instances, however, the owner of the orchard, having become discouraged by the failure of the crop or being prevented by other causes from doing what he would have wished, ploughing, cultivation, and so on, ceased from the time it became apparent that the crop had failed. In almost every case where this happened the trees, although relieved of the burden of producing fruit, failed to make any new growth.

With staggy trees, therefore, it appears that when ordinary methods fail, the total destruction of the blossoms artificially for one year might be well worth trying, so as to restore the failing vigour of the trees, such treatment to be followed by sound orchard practices. As each year it becomes more difficult to dispose of inferior fruit, the necessity for maintaining the health of the trees, if the orchard is to be profitable, should be fairly evident.

Fertilisers for Citrus Trees.

At this period of the year it is seasonable to give consideration to the question of fertilisers for citrus trees. The indications are (states Mr. R. J. Benton, Special Fruit Instructor) that in the inland areas a purely nitrogenous fertiliser is the most economical. Even if used alone for some years, sulphate of ammonia (the cheapest form of nitrogen) is satisfactory, though the growing of leguminous crops manured with superphosphate is a necessary practice. Trees from eight to fifteen years of age should receive from 4 to 9 cwt. sulphate of ammonia per acre.

In coastal, as in inland areas, nitrogenous fertilisers are strongly recommended, but on the coast application of potash also is advocated. The latter, if not used in occasional years at least, certainly seems to be a limiting factor in relation to size, and with prices at a low level large-sized fruit is always demanded. Trees in full bearing should be given an application of 5 to 10 cwt. sulphate of ammonia and 2 cwt. sulphate of potash per acre.

Definite results from applications of fertiliser are only possible if sufficient is applied. It is not economical to apply only a quarter or half of the quantities mentioned. If the orchardist's means will not permit of the manuring of all his trees at the rate recommended, it would be better to treat some of them only rather than to give the whole orchard an inadequate dressing.

Apple and Pear Export Figures.

The total exports of apples and pears from Australia during the current season amounted to 4,654,688 cases of apples and 293,924 cases of pears, as compared with 3,226,512 cases of apples and 347,039 cases of pears exported during the 1931 season.

Details of the exports from the various States are as follow:—

	1931 Season.		1932 Season.	
	Apples. cases.	Pears. cases.	Apples. cases.	Pears. cases.
Queensland	3,134	64	8,286	457
New South Wales	51,416	8,539	8,268	5,124
Victoria	361,234	206,055	134,708	151,277
South Australia	28,230	5,534	440,252	7,777
Western Australia	478,260	16,480	704,532	44,044
Tasmania	2,309,238	110,367	3,358,642	85,245
Total	3,226,512	347,039	4,654,688	293,924

Poultry Notes.

AUGUST.

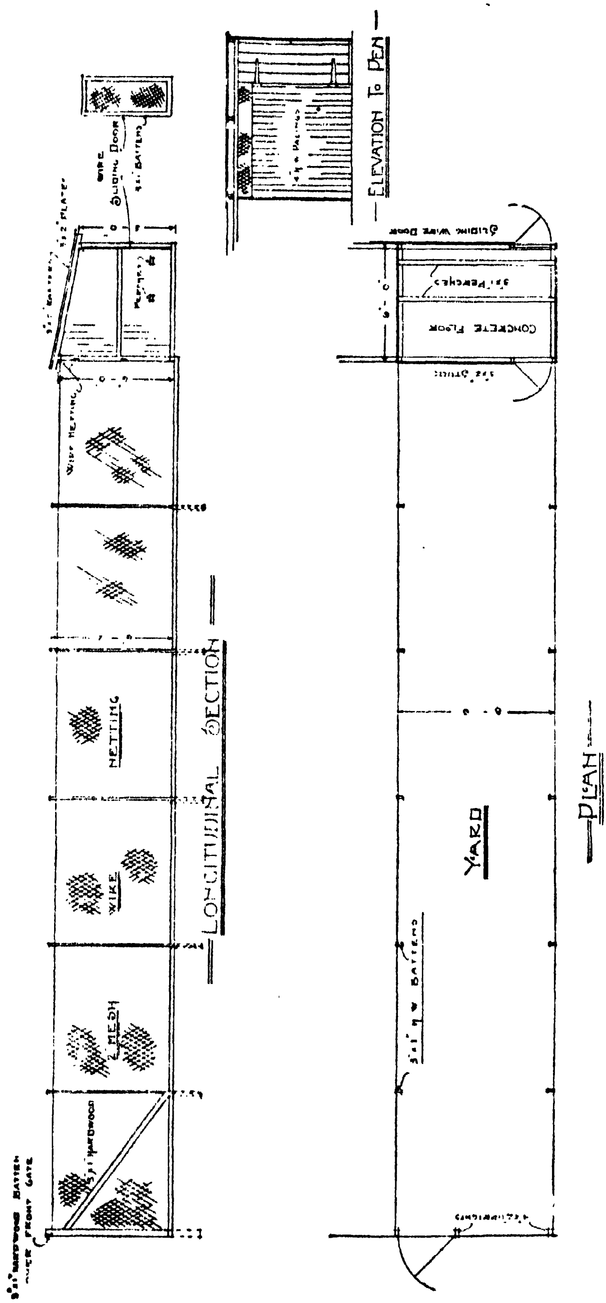
E. HADLINGTON, Poultry Expert.

Rearing the Chickens.

AMONG the hundreds of newcomers into the poultry industry during the past year or so the majority are inexperienced and they are faced with the problems which all poultry-farmers have to meet and overcome before they attain success. The most difficult part of poultry-farming is the rearing of chickens, and upon the measure of success met with in this direction depends the ultimate returns from the flock. It only stands to reason that unthrifty chickens will not grow up into the best of pullets, and if the chickens are badly reared year after year the physique of the flocks must suffer. This is one of the reasons why many poultry-keepers do not secure the returns from their farms which they should, and yet frequently they do not realise where the trouble lies.

In last month's "Poultry Notes" the main points in brooding chickens were dealt with, and while, as pointed out, it is during the brooding stage that most of the chicken troubles occur, there are many cases in which losses are sustained after the chickens leave the brooders. That this is so points to either lack of suitable equipment or faults in management. It should be realised that if the chickens have been properly reared in the brooders, and are not removed before at least six weeks old, there is no reason why losses should occur after that stage, other than by accident. A practice which is responsible for much trouble, and in some cases losses, is that of placing the chickens, after leaving the brooders, in large houses in numbers far in excess of what might be regarded as safe. In some instances as many as two or three hundred are run in one house, the idea apparently being that if a house is large enough for that number of adult birds it should accommodate an equal number of chickens. The important fact that young stock will always crowd together is overlooked, or not regarded as seriously as it should be, and as a matter of experience it is not advisable to run them in numbers of more than seventy-five to a hundred to a pen.

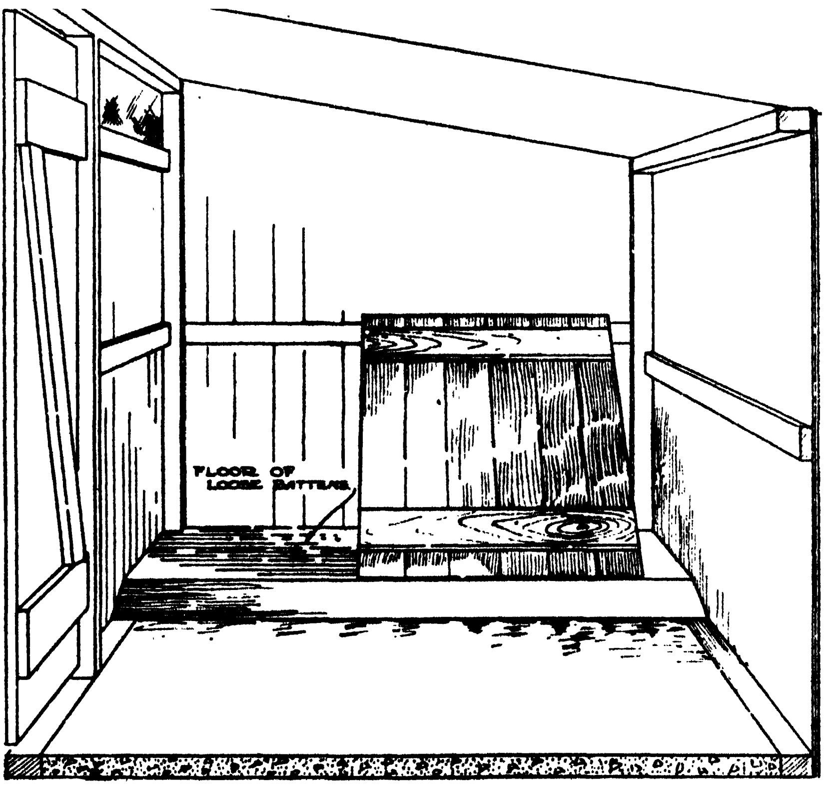
Another common mistake is to put the chickens direct from the brooders into an open-fronted house, which results in their packing together to get warm. Under such conditions it is only to be expected that some mortality will occur, and even if there are no deaths the chickens are usually checked in growth, which is never fully made up afterwards. What happens when the birds pack together to get warm is that "sweating" occurs and, moreover, many are almost stifled by being crushed into a corner. This results in some of the chickens becoming quite bare of feathers on the body, and this in itself should be a warning that conditions are not right.



Details of Chicken-rearing Pens.

Don't Remove Chicks Too Early.

On some farms the chickens are removed from the brooders at four to five weeks old, and when this is done, even though it be late in the season after the warmer weather commences, it is only inviting trouble. Certainly, in isolated cases success is met with, but it is only where close attention is given, and as a general practice the chickens should be allowed to remain for at least six weeks in the brooders, being gradually weaned off the heat towards the end of that period.



Interior of Rearing Pens, showing Movable Platform and Cover Board in Position.

It should not be thought that when the warm weather begins the chickens can safely be taken away from the heated brooders at an earlier age, because when sudden cold changes in the weather occur the chickens will suffer, and frequently this is the cause of many losses and poorly grown chickens at the end of the season.

Suitable Class of Building.

The class of building found most successful on the Department's farms and also on private farms is as illustrated. These pens, being erected in a

continuous line, are convenient to attend to (which means a saving of labour), and the chickens do well in them up to about twelve weeks of age, by which time they should have learnt to roost. The dimensions of the house and runs are as follows:—House, 8 feet by 6 feet, being 6 feet high at the front and 5 feet at the back; run, 30 feet to 40 feet long by 8 feet wide, with 6 feet netting fences. Each pen will accommodate up to seventy-five chickens when six weeks old, but if they are allowed to remain until twelve weeks of age the number should be reduced somewhat as the birds grow.

It is essential that some method be adopted for teaching the birds to roost, and the system here illustrated will be found quite satisfactory for the purpose if used as intended. As many pens as are required to be filled with chickens at one time should be fitted, at the end farthest from the door, with a movable platform of battens as shown. Ten or twelve battens

Arrangement of Platform for Inducing Chickens to Roost.

should be placed close together for the first few nights until the chickens get accustomed to going on to them, and then by taking out two or three battens the rest can be spaced about half an inch apart. This prevents the chickens from packing too closely together and allows more air between them. After another few days the space between the battens can be increased a little, care being taken that the chickens cannot get down between them. A sloping board is placed along the front of the battened platform to prevent the chickens getting underneath. In a week or so the regular perches should be placed in position and the chickens will gradually take to them, after which the battens can be removed and kept for use with the next lots.

In the cold weather, or if chickens have to be put out of the brooders before they are six weeks old, they should be made cosy by providing a

cover board about 4 feet by 3 feet to lean against the wall for them to get under, but it should not be placed close to the side wall as this would cause the chickens to crowd into the corner. Another method is to make a bag canopy about 15 inches high for the chickens to go under, leaving a good space at both sides for the free circulation of air underneath. The type of house described will be found greatly to facilitate the handling of chickens and will obviate losses after the brooding stage, provided they are not removed from the brooders while too young and are healthy when transferred.

Errors in Planning a Farm.

A feature noticeable on many of the new poultry farms which are springing up in almost every district is a tendency towards the adoption of a definite system of layout, yet, on the other hand, there are numbers of people commencing without first laying down a plan of operations, and in such cases, even though much capital is invested, the farms when completed will not represent nearly as good an asset as those which are planned on systematic lines. This is a factor which should always be kept in mind when building a poultry farm, as in the event of desiring to sell at a later date a well-laid-out farm will always be saleable at a figure much in excess of one which is lacking in this respect.

One of the first considerations in planning a poultry farm is to have the incubator room and brooder house in reasonably close proximity to the dwelling on account of the regular attention it is necessary to give the incubators and brooders in the rearing season both during the day and before retiring at night.

Next, it is important that the pens for the young stock be placed in a position where they will not be subject to the drainage from the adult birds; in fact, they should be completely separated. In the case of an oblong block of land, it is a good idea to have a laneway of at least 20 feet wide running the full length of the land near the centre, the young stock accommodation being erected on the one side, and that for the adult birds on the other side. The reason for this is to prevent possible contamination by disease germs or infestation by internal parasites which may be caused by the wash from the pens of the adult birds.

The direction which the buildings should face is another matter that has a bearing upon the effective working of the farm, and in this connection it is advisable to have the pens for chickens up to the age of ten to twelve weeks facing east or between that point and north-east. Many poultry-farmers erect these buildings with a northerly aspect, but when so built the sun becomes too hot on the runs as the season advances and causes the chickens to remain inside during the middle of the day, whereas buildings facing east receive the morning sun, and by midday a shadow is cast near the front which allows the chickens to use the runs all day. In the case of

open-fronted adult houses, however, these should be built with the front to the north, as there is less bad weather from that quarter than from any other.

All Mash, Dry Mash, Wet Mash Experiment.

In August, 1928, an experiment was commenced at Hawkesbury Agricultural College to compare the results from feeding "all mash" and "wet mash." Two separate tests were carried out in 1928, using 700 chickens in all, half of which were fed on the usual wet mash ration, and the other half on the all mash system, using the same ingredients as for the wet mash but feeding it dry in the hoppers and keeping it before the birds all the time, and instead of feeding grain late in the afternoon this part of the ration was ground up and incorporated in the all mash. This test was carried through to the end of the first year's laying of the hens.

The next year another trial on the same lines was started, and a group was also included to compare the results from dry mash feeding with the usual feed of grain in the afternoon, the composition of the ration being the same as the other two. The particulars of these experiments were published in "Poultry Notes" of August last year. It was decided, however, to continue two pens in each of the three groups for the second season to check the laying results, which, as will be seen from the comparative figures, show about the same margin of difference as in the previous tests, and in each case the wet mash groups laid a much higher number of eggs than the all mash or dry mash birds.

The figures for the second season's laying covering ten months only are as follows:—

ANALYSIS of Egg-laying in Feeding Experiment, August, 1931, to 31st May, 1932.

	All Mash Group.		Dry Mash Group.		Wet Mash Group.	
	Pen 1 (10 Birds).	Pen 2 (10 Birds).	Pen 3 (10 Birds).	Pen 4 (10 Birds).	Pen 5 (10 Birds).	Pen 6 (10 Birds).
	No. of Eggs.	No. of Eggs.	No. of Eggs.	No. of Eggs.	No. of Eggs.	No. of Eggs.
1931—						
August	151	119	153	120	202	154
September	172	118	176	150	187	168
October	163	140	132	166	219	178
November	112	114	170	129	186	143
December	110	87	110	93	131	125
1932—						
January	66	44	89	112	108	94
February	109	65	63	93	79	58
March	99	81	65	50	18	71
April	3	8	29	12	13	38
May	19	2	57	41	59	50
Totals	1,004	778	1,044	966	1,202	1,079
Totals, each group	1,781		2,010		2,281	

Averages:—All mash, 89·1 eggs per hen; dry mash, 100·5 eggs per hen; wet mash, 114·05 eggs per hen.

In the two tests started in 1928 the average egg production and profit over cost of feed were as under:—

	No. 1 Group (80 Pullets).		No. 2 Group (40 Pullets).	
	Wet Mash.	All Mash.	Wet Mash.	All Mash.
Average No. of eggs ...	154	145	152	114
Profit	£44 9s. 2d.	£40 18s. 2d.	£23 10s.	£13 3s.

The particulars for 1929 were as follows:—

	Wet Mash (80 Pullets).	All Mash (80 Pullets).	Dry Mash (80 Pullets).
Average No. of eggs	162	139	136
Profit	£43 12s. 1d.	£32 0s. 10d.	£33 15s.

It will be seen that the results throughout are strongly in favour of the wet mash feeding, and are in accordance with the result of previous experiments carried out at Hawkesbury Agricultural College.

Dockage on Second-hand Wheat Bags.

Early notice has been given by the Sydney Chamber of Commerce of the decision of all wheat shippers and millers to enforce a penalty for the use of second-hand sacks, the same as applied prior to last season. No dockage was made last year owing to the scarcity of new sacks. A minimum dockage of 6d. per bag has been decided upon for this season, and publicity is being given to the matter early so that growers will refrain from purchasing other than new bags.

To Preserve Sweet Corn.

The following is a simple and satisfactory method of preserving sweet corn:—

Boil the cobs for fifteen minutes in water containing a little salt, cool off the cobs in cold running water, then scrape the grain off the corn with a knife, pack in jars, not quite full, as the grain swells slightly, and add a little of the following mixture hot:—Water 3 gallons, sugar 1 lb., salt ½ lb. Seal the jars and boil for one and a half hours for pints and one and three-quarter hours for quarts.

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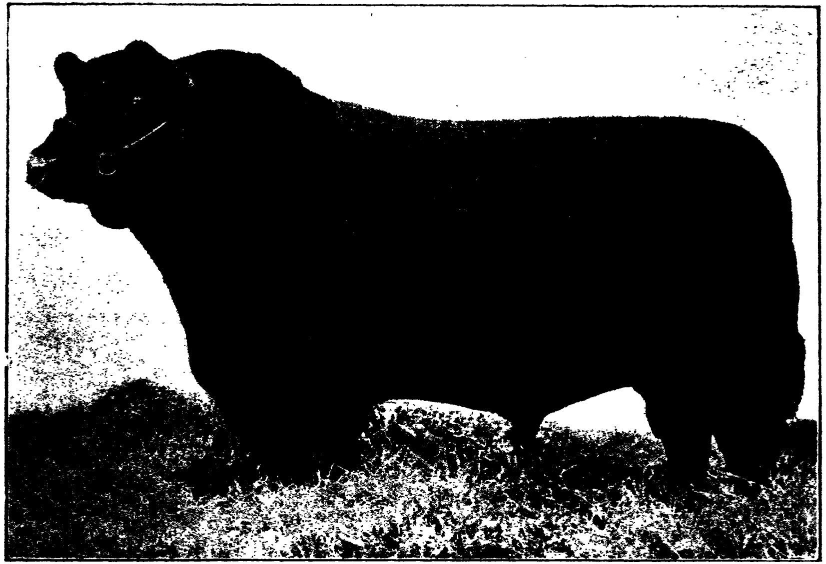

GLENCARNOCK REVOLUTION (imp. CANADA) (31939).

[Stationed at Trangie Experiment Farm.]

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Agricultural Gazette of New South Wales.

Grass and Clover Seed Production.

POSSIBILITIES OF THE INDUSTRY IN NEW SOUTH WALES.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

IN the following pages we reprint the first half of a paper read by Mr. Moodie at the Tenth Annual Conference of the Agricultural Bureau on the possibilities of establishing the pasture seed production industry in this State. The second half of this article will appear next month, and will deal fully with establishing areas for seed production, the handling of the crop, and the organising of the industry.

In introducing his subject, Mr. Moodie pointed out that in practically every other country the production of seeds of grasses and clovers, both for local use and for export, was an established and profitable industry, whereas in New South Wales farmers had made no serious attempt to supply the State's requirements in this direction. Seed importations into Australia, excluding garden and horticultural seeds, were valued at over £100,000 per annum, and there appeared to be no sound reasons why, by producing our own seeds, most of this money should not be retained in Australia.

During the present times of low prices for staple products, seed production, in Mr. Moodie's opinion, offered excellent opportunities for farmers in certain districts to increase their incomes. Apart from this aspect, however, the importance of ensuring good quality, clean seed true to name made local production not only worth while but desirable.

PRACTICALLY the whole of the grass and clover seed sown in this State is imported from New Zealand and Europe, while species such as subterranean clover and Wimmera rye grass come in from South Australia and Victoria. The most common species sown in New South Wales for pasture purposes are perennial, Italian and Wimmera rye grasses, cocksfoot, *Phalaris tuberosa* and tall oat grasses, and white, subterranean and red clovers, and seeds of all these plants could be produced within the State. There is no special merit in imported seed beyond the fact that it is cleaner than the few samples produced locally, but this fault of local seed is a matter which can easily be rectified by the adoption of improved methods. On the other hand, there is every reason to believe that local strains of grasses would give superior results to imported strains.

The New Zealand and European farmers and seed growers realise the futility of harvesting and attempting to market inferior quality seed of pasture plants, and local farmers must commence operations with the determination to produce only the best and direct their efforts accordingly.

The following review of the position in regard to each of the most commonly used pasture plants should convince farmers of the possibilities in the local production of these seeds.

Perennial Rye Grass.

Perennial rye grass is the basis of practically all pasture mixtures recommended for coast and tableland districts, and there is consequently a more extensive demand for this than for any other species. Seed of this grass is

harvested from old-established pastures by a few south coast farmers for local sale and the quality of some of the seed is good; some samples, however, contain too many weed seeds.

In building up a perennial rye grass seed industry there are two possible sources of production: (*a*) From old-establised pastures, some of which were laid down eighty years ago, and (*b*) from areas sown expressly for the purpose of seed production, from the best available strains.

The question of strain is of major importance in grass seed production, and a brief explanation of what strain implies may be appropriate at this stage. An examination of a large number of plants of any grass species will reveal the fact that there are considerable variations in the individuals. Some will exhibit obviously desirable characteristics, others are apparently

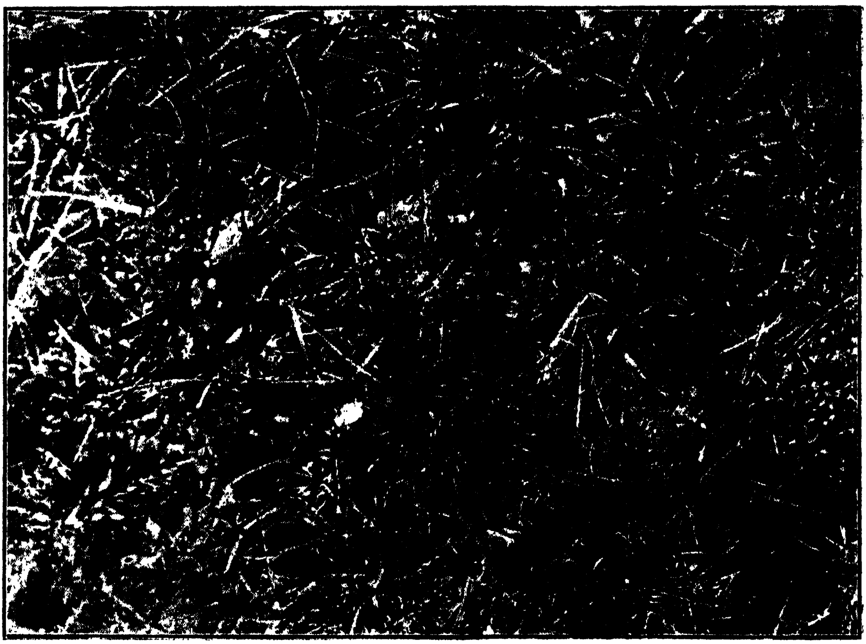


Fig. 1.—Sward Produced by the so-called Perennial Rye Grass in its Second Year.
Note bare patches due to dying out of the annual types during the summer. Weeds have become established.

of little value from the pasture point of view. A good strain, then, will be one giving a high percentage of plants showing the desirable characteristics. In the case of grass, one would look for true perennial habit, high production, ability to withstand grazing, etc.

In the case of perennial rye grass, the question of greatest importance at the moment is its perennial habit. Rye grass may be broadly divided into two groups:—

(*a*) The true perennial.

(*b*) The so-called perennial, but which, in effect, is annual or biennial in habit.

The true perennial persistent type of rye grass is permanent in the pastures, the growing period being from autumn to early summer, and growth is maintained during the summer under favourable conditions of rainfall. Though conditions may prove unfavourable during the hot months this grass will not die, but will remain dormant until the advent of rain. This type would be described by the grazier as a "root" grass, or one which produces abundant growth during its natural growth period, but which, by virtue of its true perennial habit, is always present in the pastures.

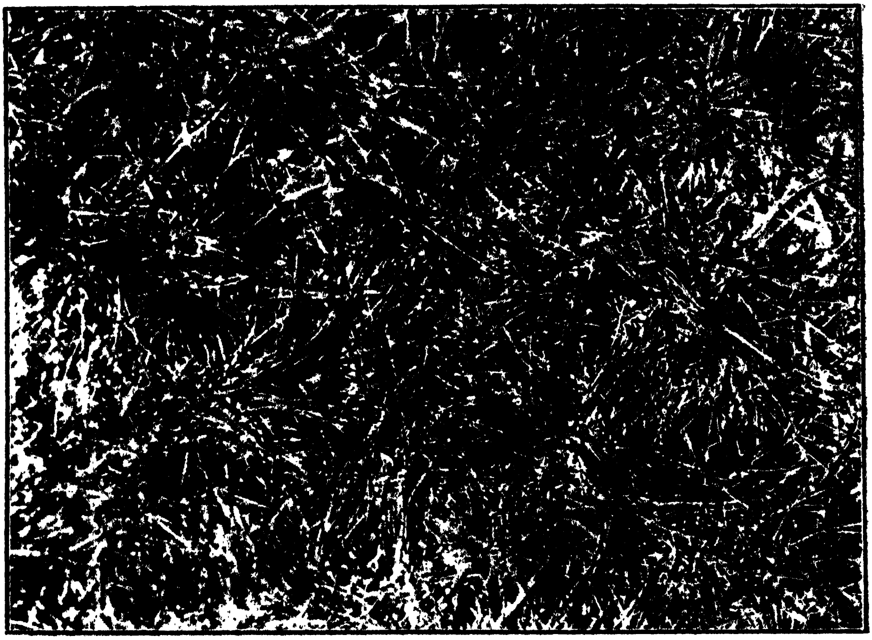


Fig. 2.—Sward Produced by Certified Perennial Rye Grass in its Second Year.
Compare with Fig 1, which photograph was taken on an adjoining area.

The so-called perennial rye grass is annual or biennial in habit and if prevented from seeding by heavy grazing in the spring of its first or second years will disappear during the hot weather. Seeding is essential to enable this grass to carry on. This type of rye grass has a grazing period extending from the autumn to late spring or early summer. If permitted, the grass then seeds freely and dies off, seedlings appearing again in the following autumn. Many farmers, unfortunately, have had experience of this type of rye grass, and the results have been such that they have been discouraged in their attempts to improve their pastures.

The result of using rye grass seed of this description can be seen in any coast or tableland district. The farmer sows a pasture, consisting of, say, rye grass, cocksfoot, tall oat grass and red and white clovers, the total

seeding being probably in the vicinity of 20 lb. per acre, half of which will be rye grass. During the first year he gets excellent late winter and spring grazing, and, continuing to use the paddock well into the summer, prevents the grasses from seeding. The result the following year is a paddock with many bare patches where these annual types of rye grass have disappeared, and the pasture then consists of the other grasses and clovers with a few odd plants of rye grass. Weeds then obtain a footing and the carrying capacity deteriorates. With a good perennial strain of rye grass this would not occur. Another point in favour of the persistent perennial rye grass is that in the event of late summer rains the plants quickly produce abundant grazing, whereas in the case of the annual types the seed which has fallen the previous year (if any) has to germinate and develop and it is a considerable time before much grazing is available.

Having distinguished between these two types of rye grass, it may be added that within the true perennial group there will be found many different strains, some leafy, high producing, drought resistant and able to withstand heavy grazing, and others which do not possess these desirable characteristics. It is not within the scope of this article to discuss this question in detail.

The practical application of the question of strain to the local rye grass seed production industry is that farmers embarking on seed production must use only the best available strains if they wish the industry to become established and permanent. As previously stated, our sources of seed supply will be from the old-established pastures or from areas sown for seed production from proved true perennial strains. The Agrostologist's Branch of the Department has taken up the question of testing existing areas, and it is quite possible that outstanding strains may be isolated locally. Farmers with established rye grass pastures who intend harvesting seed should get in touch with the Department with a view to having their strains tested. It may be assumed that seed harvested from old-established rye grass pastures in coast and tableland districts will produce plants of the true perennial type or free seeding annuals. This is a question requiring investigation, and the work having already been commenced the Department would welcome the co-operation of farmers in extending it. In a few years' time, therefore, farmers intending to produce rye grass seed may be able to obtain seed for sowing from local, true perennial, high-producing strains.

Pending the investigation of local strains, farmers in districts suitable for seed production should sow areas of New Zealand Government certified perennial rye grass. This has proved suitable to our conditions, and is the most desirable type on the market at present. On no account should the ordinary so-called perennial rye grass of commerce be sown for seed production purposes.

Districts suitable for the production of seed of perennial rye grass are portions of the southern, northern and central tablelands, the Murrumbidgee Irrigation Areas and the central and south coast. The better quality

soils are most suitable for the purpose. Sow in the autumn at 16 to 20 lb. seed per acre. The average yield per acre is between 20 and 25 bushels. Under adverse conditions the yields may be as low as 8 or 10 bushels, and under favourable circumstances 50 to 70 bushels per acre may be obtained. Yields of 30 to 40 bushels per acre may be expected from well-managed pastures under normal seasonal conditions. Returns to the farmer vary from 7s. 6d. to £1 per bushel, according to market rates, the quality of the strain and seed, and whether sold to seed merchants or to other farmers.

Italian Rye Grass.

There is a steady and increasing demand for seed of Italian rye grass in coast and tableland districts, and as it is a tall grower there is little difficulty in handling the seed crop. Italian rye grass does not require to be harvested from old pastures, as it is annual or biennial in habit. Nor is strain so important as with perennial rye grass.

Fig. 3.—Portion of a Paddock of Wimmera Rye Grass in the Boggabri District.
An increased demand for seed of this species will naturally follow the wider use of this grass in the wheat belt.

The tablelands and irrigation areas are the most suitable districts for seed production. Sow in the autumn at the rate of 16 lb. seed per acre.

Although prices are lower for this seed than for perennial rye, the grass is a prolific yielder, and 40 to 60 bushels per acre may be expected. Retail prices are usually from 7s. 6d. to 10s. per bushel. The seed crop will, of course, be taken off the first year.

Wimmera Rye Grass.

This is a seed crop for the wheat farmer, as the grass thrives during the winter and spring in wheat districts. Wimmera rye grass is annual in habit, but once established a seed crop can be taken off each year without re-sowing. The seed which falls during harvesting will provide for this.

A good demand exists for this seed and it will steadily expand, as the grass is suitable for sowing on a wide range of country—on the tablelands, slopes, in the Riverina and on certain parts of the coast.

A heavy yielder of seed, Wimmera rye grass may be expected to produce 20 to 60 bushels per acre. The retail price is generally in the vicinity of 10s. per bushel.

Sow in the autumn at the rate of 4 to 6 lb. per acre. Both grazing and a seed crop may be obtained during the first year.

Cocksfoot.

Practically all pasture mixtures for coast and tablelands include cocksfoot, and being one of the most valuable grasses the seed is always in demand. As in the case of perennial rye grass, there are various strains of cocksfoot, some much superior to others. Here again the perennial habit of the grass is of major importance, and only strains producing long-lived plants should be sown for seed production. Fine leafy strains of cocksfoot are of greater value for pastures than the more stemmy hay types.

In establishing areas for seed production, it would be wise to sow "Akaroa" in preference to New Zealand Commercial or Danish seed.

Cocksfoot seed could be readily produced in tableland or irrigation area districts. The yield of seed varies from 150 to 400 lb. per acre, and the retail prices from 1s. to 1s. 5d. per lb.

Seed producing areas should be sown in the autumn at the rate of 16 to 20 lb. seed per acre.

Phalaris tuberosa.

Seed supplies of this grass are very irregular, and as the demand usually exceeds the supply the price is always high. With the advent of regular supplies at a reasonable figure, extensive areas would be sown in coast and tableland districts, thus creating a greater demand.

Phalaris tuberosa presents some difficulties in harvesting, due to uneven ripening and shedding of the grain, and occasionally the seeding is poor if the weather happens to be wet at flowering time. In the latter event, as soon as it is apparent that seed is not setting well, the growth should be be cut, and the seed crop taken from the ensuing growth.

Growers specialising in seed production will have little difficulty in handling this crop and obtaining good returns. Seed production can be carried on in coastal and tableland districts on the better quality soils.

Sow in the autumn at the rate of 4 lb. per acre. The yield of seed varies from 40 lb. to 112 lb. per acre, although with improved methods of pasture treatment there is no doubt these yields could be considerably increased. The retail price of the seed is 4s. per lb.

White Clover.

This plant is common in coast and tableland pastures and seeds freely. Seed is harvested occasionally on the North Coast, and this work could be considerably extended. There is always a brisk demand for white clover seed, and consequently a good market.

When establishing areas of this crop for seed production, sow in the autumn at the rate of 4 lb. per acre, using New Zealand Government certified seed. Portions of the coast and tableland districts are suitable for seed production.

Yields of 100 to 400 lb. per acre are harvested, and the retail price ranges from 1s. 6d. to 3s. per lb.

Subterranean Clover.

There is a good demand for seed of subterannean clover for sowing in coast, tablelands, and slopes districts. Parts of the tablelands, southern slopes and eastern Riverina are the most suitable districts for seed production. Sow 4 lb. seed per acre in the autumn. Yields of 600 lb. seed per acre can be expected, and the retail price varies from 1s. 5d. to 1s. 8d. per lb. Owing to the large quantities of seed produced in South Australia farmers are advised not to sow areas of this crop purely for seed production at the present time.

In harvesting subterranean clover for seed, the procedure is entirely different to that adopted for other pasture plants, owing to its peculiar habit of burying some of its seed. Being annual in habit, the top growth dies in the early summer, the material then being raked up with hand- or horse-rakes and stacked. When dry, the material is put through the thresher to remove stalks, etc., and the seed pods finally treated with a special subterannean clover huller.

Perennial Red Clover.

Contrary to popular belief, this clover produces good seed in New South Wales, and there is no reason why it should not be handled commercially.

Perennial red clover gives excellent results in the pastures in coast and tableland districts, and considerable areas are sown each year; there is consequently an assured market.

Sow in the autumn at the rate of 6 to 8 lb. seed per acre. Yields of 180 to 400 lb. seed per acre are obtained, the retail price for which is from 1s. 5d. to 1s. 8d. per lb. The southern and northern tableland districts are the most suitable for the production of perennial red clover seed.

(To be continued.)

Phalaris stenophylla Incorrectly Named.

Particulars of its Introduction and Botanical Classification.

J. N. WHITTET, H.D.A., Agrostologist.

DURING the past three years prominence has been given to a prolific type of *Phalaris* that was distributed by this Department to a number of graziers, farmers and agricultural institutions throughout Australia. As Peruvian winter grass (*Phalaris stenophylla*) it was grown and sold by Luther Burbank, and the following description has been extracted from his 1923 plant catalogue:—

PERUVIAN WINTER GRASS (*Phalaris stenophylla*).

For the past few years I have been testing a strong-growing, hardy, evergreen grass which was sent me from the mountains of Peru, where it is very justly considered the "king of winter grasses." During the coldest of winter weather here,

Strain Selections of *Phalaris tuberosa* (right) and *P. tuberosa* (Burbank's type) on left.
New England Experiment Farm, Glen Innes.

when all other grasses, including also alfalfa, are brown and dormant, this remains fresh, green and growing. It grows thriftily through drought, heat, snow, frost or flood, producing fresh green grass feed abundantly and constantly of superior quality throughout the whole twelve months. It will be extensively grown, like alfalfa, in all mild climates, supplying, as it does, fresh green feed when all other grasses and alfalfa are apparently dead. Peruvian winter grass is the most promising of several thousand foreign and native grasses for winter feed which have been tested on my farms during the past forty years. For all kinds of stock and for poultry it is unexcelled. If you live in a mild climate, do not fail to get an early start of this winter grass.

Introduction into Australia.

On 25th August, 1923, Mrs. H. M. Hindmarsh, "Wiaraga," Bellingen, New South Wales, sent the writer a small packet of seed of this grass which she had purchased direct from Burbank. About fifty plants were propagated from this supply, and one plant that exhibited superior growth characteristics was divided up and re-planted. This latter material was later sent to a number of the Department's experiment farms for trial. Further vegetative propagation was conducted in subsequent seasons, mainly at the New England Experiment Farm, Glen Innes, and from this source most of the roots and seed were distributed to graziers and farmers for trial.

Two prominent graziers in the Guyra district, who have been growing *Phalaris tuberosa* for the past fifteen years, were so impressed with the vigour of *Phalaris stenophylla* that they each planted an area of 2 to 3 acres with roots of the latter, and these experimenters now report having sown larger areas with seed harvested from the root-planted areas.

Although *Phalaris stenophylla* exhibited slightly different growth characteristics to the grass we knew in 1929 as *Phalaris bulbosa* (now *P. tuberosa*), no well-defined botanical differences were apparent, and in that year a collection of the various types of *Phalaris* were forwarded to the Royal Botanic Gardens, Kew, England, for examination. The report from Kew Herbarium was to the effect that the spikelets of *Phalaris bulbosa* Linn. and *Phalaris stenophylla* had the same general construction and showed the same characters which distinguish *Phalaris tuberosa* from the other species of *Phalaris*; it also appeared advisable, the report continued, to use the name *Phalaris tuberosa* Linn. in preference to that of *P. bulbosa* Linn. The alteration of *P. bulbosa* to *P. tuberosa* was subsequently made and is now adopted in this State by botanical workers, seedsmen, graziers and farmers.

To be Called Phalaris tuberosa (Burbank's Selection).

Owing to the fact that *P. stenophylla* was giving such excellent results and appeared to be a more vigorous type than even some of our improved types of *P. tuberosa,* it was decided temporarily to isolate and continue to grow it under the name applied to it by Burbank. A subsequent search of South American and other literature, however, failed to reveal a botanical description of *Phalaris stenophylla.* Furthermore, in view of the identification carried out by Kew the name *P. stenophylla* cannot be retained, and it is intended in future to classify it as *Phalaris tuberosa* Linn., and in order to differentiate between it and other forms of *P. tuberosa* it has been decided to apply the distinguishing name of "Burbank's Selection" to this type.

Protect Your Machinery Against Depreciation.

A timely and thorough overhaul of farm machinery saves many pounds in costly repair bills and ensures against a hold-up of operations during the busy times. Machinery should be given ample protection against the elements. Harvesting machinery in particular depreciates rapidly and should therefore be given every attention. A machinery shed is essential, and depreciation can be lessened greatly by the judicious use of paint and oil.

Australian Wheat.

INFLUENCE OF CLIMATE ON GRAIN QUALITY.

H. WENHOLZ, B.Sc.Agr., Director of Plant Breeding.

THE general influence of climate on the quality of wheat grain was dealt with in a previous article in this *Gazette* (see August issue, page 585). The present article discusses the effect of the Australian climate, and that of New South Wales in particular, on grain quality.

OVER the greater part of the wheat belt of Australia the climate during the maturing period of the grain (October to December) is one of gradually increasing temperatures and rather rapidly diminishing rainfall, alternating with cool moist periods. The latter do not last more than a day or two and the predominating weather is of the former type. Such conditions should be capable of producing grain of good protein content.

In Western Australia, where the spring rainfall ceases more suddenly than in other States, the conditions are still more favourable for the production of high protein grain, and with suitable varieties this State could produce grain of high quality. In South Australia, Victoria and the southern and south-eastern portions of New South Wales the spring rainfall does not cease so suddenly and spring temperatures do not rise appreciably until near December. This causes a more prolonged ripening of the grain with a greater tendency to softness than in other parts of the wheat belt of Australia. It is possible, however, that with suitable varieties grain of moderately good protein content can be produced here. The south-western and central-western portions of the New South Wales wheat belt have less spring rainfall and warmer temperatures than the last mentioned areas, and are capable of producing grain of a higher protein content. The north-western portion of the New South Wales wheat belt, together with Queensland, is mostly outside the influence of cool Antarctic weather control in spring and warmer temperatures more quickly prevail. Generally speaking, these areas should produce wheat of the highest protein content in Australia. It is from here that the first new season's wheat comes on to the market in Australia.

Although these general climatic conditions obtain in these areas, seasonal conditions have sometimes a marked influence and of course the inherent character of the varieties of wheat grown also helps to determine the actual quality of the grain produced.

Another factor which has some influence on the protein content of the grain, and which is often lost sight of, is the climate during the early growth of the wheat. No wheat in Australia is definitely of "winter habit" of growth, as the term is understood in America and Europe, being rather

of "spring habit," but it is practically all sown in autumn. On account of the absence of severe winter cold, which precludes any possibility of winter injury or winter killing, the wheat makes continuous growth throughout the winter. In the southern part of Australia, which comes within the belt of assured winter rainfall, the soil is mostly cold and wet during this period and nitrogen intake or assimilation by the crop during its early growth is thus very low. This must react against the ultimate production of grain of the highest protein content. In the northern portion of the wheat belt of Australia, particularly in the far western and north-western part of New South Wales and also in Queensland, the winter rainfall is lower and the winter temperature milder, nitrification and nitrogen assimilation by the crop are more active and as the soils are also richer in nitrogen, the conditions are much more favourable for the development of high protein grain.

The Present Quality of Australian Wheat.

Forty or fifty years ago, wheat growing in Australia was confined to the cooler districts with abundant rainfall, and the varieties grown were of late-maturing habit. Under these conditions Australian wheat was very soft in character and of low gluten content. Then Farrer, by the introduction of early-maturing wheats from India and the Fife wheats of excellent grain quality from Canada, bred earlier wheats of better quality and extended the culture of wheat into drier districts. Farrer's wheats of very high quality, such as Bobs, Cedar, Comeback and Jonathan, never stayed long in commercial cultivation because of their comparatively low yields, but the remarkable productivity of Federation ensured its very wide popularity. Although it shows some improvement in grain quality on the late-maturing wheats of the last century, Federation, which, with its crossbreds, had dominated the character of Australian wheat up till 1925, can only be regarded as producing a grain of medium quality under the best conditions. Although other wheats, such as Yandilla King, Canberra, Waratah, Nabawa and Gallipoli, etc., now largely predominate, the general character of Australian wheat has not altered greatly. If anything, these varieties are probably of slightly lower quality than Federation, and, judged by world standards, the general character of Australian wheat is still of only medium to poor baking quality.

A high position has been attained in productivity with the wheats which have replaced Federation, and probably very near the utmost use has been made of soft grain quality in attaining high yield. With the exception of Nabawa, however, none of the leading varieties of wheat is resistant to flag smut, and none is highly resistant to stem rust and other diseases, and they will mostly be replaced in the near future by better-yielding disease-resistant varieties. While this is being attempted, plant-breeders should, at the same time, make a vigorous effort to improve the grain quality of Australian wheats generally, if it is possible for higher quality to be compatible with higher yield.

In Western Australia Nabawa is by far the leading variety, and, on account of the poor inherent quality of its gluten, not even the somewhat favourable climate can produce a grain of high baking quality from it. Gluyas Early, Merredin (Aussie), Federation, Yandilla King, and Gresley are other varieties largely grown in Western Australia, and these are of little better quality. Only small areas of Minister, Florence, S.H.J., and Pusa 4 are grown, but they should produce grain of excellent baking strength under Westralian conditions.

In South Australia the varieties Gluyas Early, Federation, Ford, Late Gluyas, Currawa, Sultan, Caliph, and Nabawa are the chief wheats grown. These are of medium to poor quality, so that grain of medium to poor baking strength only is produced in that State. The only extensive production of grain of good baking value comes from a reasonably good area of Florence and a little of the variety Quality. Ford is of moderately good quality.

The varieties most largely grown in Victoria, viz., Gallipoli, Federation, Ranee, Currawa, Major, Penny, Nizam, Sepoy, Joffre, Rajah and Yandilla King are all of inherently poor quality, and, combined with the climate, produce only medium to weak flour wheats. The only reasonably good baking wheats are likely to be derived from the limited quantities of Minister, Pusa 4, and Ford.

In New South Wales the leading varieties at the present time are Nabawa, Waratah, Federation, Yandilla King, Turvey, Canberra, Marshall's No. 3, and Penny. These are all inherently low quality wheats, and not even the most favourable climatic conditions for producing high protein or gluten content in the grain can make the grain of high baking quality. The only grain of good or moderately good baking quality is likely to be produced from the limited areas of Pusa 4, Florence, Duchess, Minister, Dundee, Ford, and perhaps Hard Federation.

In Queensland a distinct change takes place in the inherent quality of the varieties grown. Pusa 4 and Florence are the leading wheats produced and both these are very early-maturing varieties of naturally high quality. Moreover, with a climate and much of the soil favouring a high protein content, Queensland wheat is generally of excellent baking quality. But that State barely produces sufficient wheat for its own requirements.

Districts of New South Wales and Grain Quality.

The tableland districts of New South Wales, which have the highest rainfall and the coolest climate and where mostly late maturing varieties are grown, naturally tend to produce soft wheat of the lowest baking quality. The Northern Tableland has an even cooler climate than the Central Tableland because of its much higher elevation, and with inherently soft, very late-maturing wheats, such as Cleveland and Rymer principally grown, only grain of poor baking quality is produced. Only a small area of wheat is grown in this district, chiefly because other crops such as oats, maize and potatoes are more profitable, and also because of the ravages of

stem rust. Ford is the most rust-resistant commercial variety at present known in New South Wales, and its comparatively high resistance to stem rust should make it increasingly grown in the near future in this district. This will not advance the grain quality of the district to any appreciable extent, except from the standpoint of plumpness of grain and bushel weight.

A somewhat larger area of wheat is grown on the Central Tableland, but still not very great. There is less rain in the spring than on the Northern Tableland, but the climate is so cool that the maturing period is comparatively long. Since Cleveland, a late-maturing wheat that is not of inherently high quality, is chiefly grown, the grain produced generally in this area is of rather low baking quality. These tableland districts are well suited to the production of soft wheat for biscuit manufacture, especially with the culture of inherently softer wheats than are at present grown.

On the Central and South-western Slopes there is a very extensive area of wheat under cultivation. By reason of the assured winter rainfall and the comparatively cool spring, very good yields of wheat are obtained in these districts. These conditions are not conducive to the production of high protein wheat, and as the varieties grown are chiefly Yandilla King, Waratah, Federation, Turvey, Canberra, Penny, Union and Gallipoli, none of which is of inherently high quality, this part of the wheat belt, which constitutes the largest portion in New South Wales, mostly produces wheat of comparatively poor baking strength.

In the districts further west with more limited rainfall and warmer spring temperatures, the climate really lends itself to the production of wheat of better quality. The varieties grown are mostly Waratah, Canberra, Nabawa, Hard Federation, Gresley, Ranee, Riverina, Bald Early, Florence, Clarendon, Duri, Bobin and Gullen. Most of these are naturally medium soft wheats, but Hard Federation, Florence and Gullen may produce grain of moderate to good baking quality in this climate. These varieties are, however, not very largely grown, because they do not yield as well as the wheats of medium quality.

On the North-western Slopes the winter rainfall is lower than in the wheat belt further south, and particularly on the rich black chocolate or dark-red soils which are well provided with lime, nitrification is much more active, at least in late autumn and early spring if not in winter, under these conditions. A high nitrogen intake or assimilation therefore goes on during the early stages of growth of the crop. With higher spring temperatures promoting early maturity, all conditions favour the production of grain of high protein content. As this area lies within the influence of summer rains, there is always danger from rust and bleaching effects on the grain quality. But the prevalence of summer rains does not favour low protein grain because of their incidence. They are not usually prolonged, as is the case with the Antartic spring rains in the wheat belt further south, and, being of short duration and alternating with high spring and summer temperatures, a prolonged ripening period does not occur, and consequently the comparatively high protein content of the grain is usually undiminished.

Thus here the conditions favour the production of grain of probably the highest protein content in the State. The ultimate quality of the grain is, however, reduced by the comparatively poor inherent quality of the varieties grown. These varieties are chiefly Waratah, Nabawa, Hard Federation, Currawa, Wandilla, Aussie, Florence, Canberra, Clarendon, Duri, Bobin and Ford, with a small area of Pusa 4. Wheat of good to excellent baking quality is generally produced in this district from the varieties Hard Federation, Ford, Florence and Pusa 4, but these wheats are not grown extensively on account of their comparatively lower yields.

The above is the position with regard to the quality of Australian wheat and it promises to remain so for at least some years to come. It is possible, however, that some change will be brought about in the future by millers and merchants giving a premium for quality and by breeders developing wheats of better quality, though it is not known at present how far these efforts will be successful.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6,200
Swane Bros....	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

—C. G. Savage, Director of Fruit Culture.

The Agricultural Bureau State Conference.

HELD AT HAWKESBURY AGRICULTURAL COLLEGE.

THE tenth annual State conference of the Agricultural Bureau of New South Wales, which was held at Hawkesbury Agricultural College (Richmond) from 26th to 29th July, was one of the most successful to date. Over three hundred delegates and visitors attended the conference.

The place which the Bureau has won as a movement representing all kinds of primary industries and the wide scope of interest created by its work were evidenced by the attendance of the Hon. Hugh Main, M.L.A., Minister for Agriculture, Hon. E. S. Spooner, Assistant Treasurer, the

Some of the Officials, Visitors and Delegates who Attended the Conference.

consuls and commissioners for several foreign countries, the Under Secretary for Agriculture (Mr. G. D. Ross), the Under Secretary for Lands (Mr. J. Herlihy), officers of Health Department, Transport Commission, and representatives of many rural organisations.

An innovation this year was the broadcasting of the official opening and of some of the addresses.

The Minister Opens the Conference.

The official opening was performed by the Hon. Hugh Main, M.L.A., Minister for Agriculture, who assured delegates that the whole State was interested in the application of their practical knowledge towards the solution of some of the problems that faced the nation.

The depression had "hit" Australia just after several bad seasons, but the farmers had not thrown in the sponge; they had tried to keep on an even keel by increasing production. The nation looked to the primary producers to carry on, and to this end the Government would aid as far as possible. It would use its endeavours to promote rural settlement, particularly share-farming in dairying districts, it would allow primary producers to market their products free from political control, and would build wheat silos where they would do the most good as rapidly as funds would permit. Assistance would also be given to agricultural research, and advances would be made to farmers for improvement work, while the reduction of unemployment would always be one of the Government's main aims. It was also the intention of the Government to bring in a measure for the reduction of farmers' debts in the near future.

The General President's Annual Report.

In his annual report, Mr. W. W. Watson (General President) emphasised the wide scope of the work now undertaken by branches of the organisation, and stated that the present adversity had tended to make branch programmes more definite. Among the activities undertaken were experiments and demonstrations, field days, crop and stock competitions, addresses, co-operative buying, selling and consigning, debates, social gatherings, etc. Ten district conferences had been held during the year.

When the conference was not in general session the programme provided for special wheat and sheep, dairy, fruit and vegetable and women's sessions, which were conducted concurrently. In this way a much greater volume of business was possible, and delegates were enabled to devote their time to matters which directly concerned the branches they represented.

The General Sessions.

Addresses of particular interest, and on subjects somewhat distinct from the many given on actual farm work, were those of the Hon. E. S. Spooner, Assistant Treasurer (who discussed the State's economic position), Dr. W. P. Chen, Consul-General for China (who spoke on Australian trade with China), Mr. H. D. B. Cox, of the United Pure-bred Dairy Cattle Breeders' Association (who put forward a scheme for an intense investigation of bovine contagious abortion), Mr. H. Black (who explained the Russian five-year plan in agriculture), and of Captain Aarons (who discussed a scheme for finding employment for youths in rural industries).

Bureau members realise that not only must the man on the land understand the practical and economic aspects of his industry, but must be able to express clearly and systematically his attitude towards those things

which affect his interests. To this end debating is encouraged, and these featured prominently on this year's programme, the adjudicators explaining the points awarded the speakers in order that the full educational benefit might be obtained.

The Dairy Sessions.

At the special dairy sessions addresses were delivered by Mr. L. T. MacInnes, Director of Dairying (on the economics of the industry), by Mr. C. A. Hamilton, Chairman of the Metropolitan Milk Board (on the operations of the board), and by Mr. J. L. Shute, Primary Producers' Union (on the value of organisation to the dairy-farmer).

At this session also Mr. A. W. S. Moodie, Assistant Agrostologist, gave an address on the possibilities of the production of grass and clover seed locally. The first half of Mr. Moodie's address is printed elsewhere in this issue.

Wheat and Sheep Matters.

In addition to talks on the purely practical aspects, a number of addresses dealing with the economics of production were delivered at these sessions, those of chief interest being by Mr. S. M. Artaud, of Balldale (on fat-lamb raising), Mr. T. J. A. Fitzpatrick, of Temora (on wool values stabilisation), Mr. E. S. Clayton, Senior Experimentalist of the Department (on Australian wheat quality in relation to market requirements), Mr. D. McAlary, of Boggabri (on mutual risk sharing in hail insurance), and Mr. B. M. Arthur, Senior Agricultural Instructor (on the steps that farmers have taken to meet the economic position).

Fruit and Vegetable Growers' Sessions.

The branches of the Bureau interested in the growing of fruit and vegetables are affiliated into a single group, irrespective of their geographical location, and the delegates from these branches met for a number of sessions during the conference.

Addresses were given by Mr. G. Barrett, of Dooralong (on citrus culture), by Mr. A. Sorby, of Macquarie Fields (on tomato culture), by Mr. S. O. Masters, of Bolwarra (on the work of the Potato Growers' Council—to which Mr. Masters is the Bureau delegate), as well as by a number of departmental officers.

The Women in the Bureau.

The Bureau slogan is a threefold one—"Better Farming, Better Business, and Better Living"—and it was long ago realised that to achieve the third of these objectives it was necessary to include farm womenfolk as members and to cater for their needs.

The programme for the women's session at the annual conference was a comprehensive one, and included talks and demonstrations on such subjects as use of foodstuffs, millinery, dressmaking, gardening, care of the teeth, physical culture, health matters, and an address on racial hygiene.

Details of Proceedings Published in the "Bureau Record."

Detailed proceedings of the conference have already been published in the *Bureau Record,* the official monthly journal of the Agricultural Bureau movement, which is distributed free to every member.

The Department is always anxious to hear from individuals or bodies desirous of forming new branches of the Agricultural Bureau. Write for a leaflet explaining the movement and telling how to organise a branch in your district.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1932:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ...	805,295	66,367
Tomatoes ...	66,908	...
Bananas	40,729	...
	bunches.	
,, ...	896	...
	cases.	
Pineapples ...	27,042	...
	lb.	lb.
Canned Fruit ..	196,896	...
Dried Fruits—		
Unspecified ...	11,340	...
Currants ..	3,836	...
Raisins ..	4,704	...
Apricots ...	616	...
Apples ...	868	...
Peaches ..	560	...
Pears	280	..
Prunes ...	280	5,152

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	5,932
Bananas ...	....	3,574	...
Lemons ..	....	...	1,245
Oranges ..	....	26	16,985
Grape Fruit ...	....	56	90
Pears	....	...	1,156
Pineapples ...	....	...	1,058
Other	....	306	8,102
Dried Fruits—		lb.	lb.
Apples, pears, peaches, etc.	Commonwealth	84	...
Apples ...	....	...	3,039
Apricots ..	....	...	1,496
Currants .	....	...	122,629
Figs	Turkey	2,196	...
,, ...	United Kingdom	39	...
Peaches ..	....	...	560
Prunes ...	Commonwealth	492	1,664
,, ...	United States ...	510,633	...
Raisins—			
Sultanas .	....	...	1,042,702
Lexias ...	....	...	704
Other .	....	...	38,314
Dates	China	60	8,494
,, ...	Iraq	717,252	...
Other	China	1,337	2,601
Preserved in liquid—			
Apricots ...	....	...	822,411
Peaches ...	....	...	527,417
Pears ..	....	...	20,753
Pineapples ...	....	...	3,489
Raspberries	....	...	1,239
Other ...	....	...	58,618
		Gallons.	
,, ...	....	133	...

Fodder Conservation in Coastal Districts.

Reports of R.A.S. Championships, 1932.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

SEVENTEEN societies in coastal districts organised fodder conservation competitions this season. The number is a record for the coast, being four more than in any previous year, and was due to the encouraging response from the societies on the lower north coast. Previously, Dorrigo Agricultural Society was the only one on the north coast represented in the competitions. This year, however, competitions were conducted by six societies, and for the first time it was possible to hold a championship competition in the north coast division.

Hitherto, the conservation of fodder has been neglected by the dairy farmers on the north coast, and it is gratifying that efforts to arouse interest in this direction have now met with success. During the past year there has been great activity among dairy farmers in that portion of the north coast covered by these competitions, and particularly in the Manning River district, where a large quantity of fodder has been successfully conserved as silage, both in tower and trench silos. The unfavourable nature of the late winter and spring months in recent years has, no doubt, persuaded farmers of the necessity for providing reserves of fodder for lean periods. It is considered that the fodder conservation competitions have now been successfully launched on the north coast, and judging by the general enthusiasm displayed it is safe to predict that there will be a considerable improvement in entries next year, both as regards number and quality.

Interest in the competitions has been well maintained by south coast farmers, especially in view of the very dry summer which was experienced throughout the districts on the far south coast. This was responsible not only for a greater drain on the conserved fodders, but also resulted in decreased yields of maize and other fodder crops on which dairy farmers relied for the bulk of their fodder reserves.

The conditions and scale of points for judging the competitions in coastal districts are as follows :—

Fodders Eligible for Conservation to be—Concentrates (including all grains), or roughage—as hay (*e.g.*, lucerne, oaten, wheaten, clover, grass), silage, and any other fodder suitable for conservation, to have been produced on the land owned, leased or held on shares by the competitor. No farmer or grazier whose holding consists of less than thirty (30) acres shall be eligible to compete.

SCALE OF POINTS FOR JUDGING—COASTAL AREAS.

		Points.
1. Suitability and Quality of Fodder		65
(*a*) Judged according to the suitability of fodder or combination of fodders for the purposes for which they are required	30	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	35	

Scale of Points for Judging—Coastal Areas—*continued*.		Points.
2. Location and Protection		40
(*a*) Locality—Location of the site, having regard to fire, flood, economy in feeding, and general access	20	
(*b*) Protection—Protection from weather, pests, stock, fire and general deterioration	20	
3. Economy of Production		25
Including land value, production, storage and feeding costs.		
4. Carrying Capacity		60
Quantity for the requirements of competitor's holding to be based on the carrying capacity of the holding (when improved and under natural pasture). The maximum amount considered to be competitor's requirements per cow, *i.e.*, 20 cwt. lucerne hay or its equivalent in feeding value (1 cwt. lucerne hay = $1\frac{1}{2}$ cwt. cereal hay = 3 cwt. silage = $\frac{1}{2}$ cwt. grain).		
5. Quantity of Fodder in Excess of Requirements		10
At the rate of 5 points for surplus fodder equal to the quantity required for the holding.		
Total		200

South Coast Championship.

The societies which conducted competitions were:—Bega, Berrima District, Berry, Bodalla, Camden, Dapto, Kangaroo Valley, Kiama, Moruya and Shoalhaven (Nowra) agricultural societies, and Tilba Tilba Agricultural Bureau.

Judging was commenced at Bega on 6th June and completed at Camden on 11th June.

TABLE of Awards—South Coast Championship.

Society.	Competitor.	Suitability.	Quality.	Location.	Protection.	Economy of Production.	Carrying Capacity.	Surplus.	Total.
Maximum points		30	35	20	20	25	60	10	200
Bodalla	H. Jeff Bate, "Durham Farm," Bodalla ...	29	33	19	19	22	60	2	184
Berry	J. R. Shepherd, "River-view," Bomaderry ...	26	33	18	19	23	60	2	181
Berrima	A. C. Brown & Sons, "Collingwood," Exeter	23	30	18	18	23	60	8	180
Camden	Porter Bros., "Corstor-phine," Camden ...	27	30	17	18	22	60	5	179
Dapto	D. A. Timbs, "Elmgrove," Dapto	26	32	18	19	22	60	1	178
Bega	O. Guthrey, "Elmgrove," Bega	28	32	17	18	21	60	1	177
Moruya	Bartlett Bros., "Kiora," Moruya	27	31	15	16	22	60	3	174
Kangaroo Valley ...	H. O. Cox, "Melross," Kangaroo Valley ...	25	28	17	18	21	60	1	170
Tilba Tilba (Agricultural Bureau) ...	H. J. Bate, "Mountain View," Tilba Tilba ...	22	32	19	20	23	48	...	164
Kiama	C. R. Chittick, "Lemon Grove," Jerrara ...	23	28	18	18	22	46	...	155
Shoalhaven (Nowra)	J. R. Knapp & Sons, "Swanlea," Bolong ...	23	31	18	18	23	41	...	154

The general standard attained by competitors was an improvement on that of previous competitions, and although the championship was won comfortably by Mr. H. Jeff Bate, there was a margin of only one point separating each of the next five competitors in order of merit, indicating the closeness of the competition. Every one of these entries was an excellent example for emulation by dairy farmers generally.

This is the third year in succession that Mr. H. Jeff Bate, of Bodalla, has achieved the honour of winning the championship, and his success is well merited, as he has brought his methods of conserving fodder to a very high standard of efficiency. His property of 428 acres, of which 110 acres are rich flats, 178 acres hill land and 140 acres scrub, was estimated to carry seventy-six cattle when under unimproved pasture, and the cropping area includes 7 acres of maize for grain, 9 acres of maize for green fodder and silage, 8 acres of lucerne, 2 acres of sorghum, 9 acres of oats and 7 acres of red clover. The conserved fodders included 151 tons of maize silage stored in two concrete tower silos, which were adjacent to the feeding stalls; 35 tons of lucerne hay stacked in a hayshed, and 11 tons of maize stored in a mouse-proof corn crib, all conveniently situated and well protected. The total quantity was in excess of requirements, the quality was excellent, and, moreover, the combination of fodders was satisfactory for the feeding of a balanced ration.

Mr. J. R. Shepherd, of Berry, repeated his success of the previous year by again winning the second prize. The total area of his property is 394 acres, the carrying capacity of which was estimated to be eighty head of cattle. The fodder reserves included 128 tons of chaffed maize fodder conserved in two concrete tower silos, 112 tons of grass silage in two pits, 14 tons of lucerne hay and 6 tons of maize grain stored in barns. In the aggregate there was more than a sufficient quantity of fodder according to the regulations of the competition. The quality was first class, but the proportion of a high protein fodder, such as lucerne, was inadequate for the provision of a satisfactory balanced ration.

Messrs. A. C. Brown & Sons won the third prize and thus improved on their position in last year's competition, in which they occupied fourth place. The carrying capacity of the property, which is 304 acres in area, was assessed at forty-three head, and the quantity of fodder conserved was over two and a half times the amount necessary to meet requirements, namely 253 tons of silage in four trench silos, three of which contained chaffed maize silage and one whole-maize silage, 23 tons of oaten hay, 13 tons of meadow hay and 2 tons of maize grain. The fodder was well protected and of good quality, but a higher proportion of legume hay was necessary to permit of the feeding of a balanced ration.

North Coast Championship.

In this first championship competition on the north coast six societies were represented, namely, Bellinger River, Dorrigo, Macleay River, Manning River and Upper Manning River agricultural societies, and Raleigh Primary Producers' Association. The judging was commenced at Dorrigo on 14th June, and completed at Taree on 17th June.

TABLE of Awards—North Coast Championship.

Society.	Competitor.	Suitability.	Quality.	Location.		Economy of Production.	Carrying Capacity.	Surplus.	Total.
Maximum points	... ...	30	35	20	20	25	60	10	200
Raleigh (Primary Producers' Association	Mrs. H. M. Hindmarsh & Sons, "Wiaraga," Bellingen	26	32	17		23	60	...	177
Manning River ...	Mr. F. O. Stokes, "Brumarlin," Mondrook ...	27	30	17		23	56	...	171
Bellinger River ...	Mr. M. M. McBaron, "Riverview," Raleigh...	23	31	16	17	22	40	...	149
Upper Manning River	Mr. E. L. R. Keech, "Dungannon," Wingham	25	31	17		21	35	...	148
Macleay River ...	Mr. D. M. Dornan, "Lawnbank," Frederickton ...	27	28	15		21	37	...	145
Dorrigo	Mr. L. W. Gregg, "Inverary," North Dorrigo	26	28	17	18	21	26	...	136

Much credit is due to Mrs. H. M. Hindmarsh & Sons for their success in winning the championship at the first attempt. The property is 146 acres in area, and of this 42 acres are river flats, 15 acres low flat, 42 acres hill land and 46 acres forest country. The cultivation area included 11 acres of maize for grain, 7 acres of maize for fodder, 2 acres of lucerne, 1 acre of sorghum, 2 acres of red clover and ½ acre of Indian cane. The conserved fodder comprised 87 tons of chaffed maize silage in two pits, which were 16 feet square and 9 feet deep, covered with a galvanised iron roof; 4 tons lucerne hay and 3 tons grass hay in sheds, and 2½ tons of maize grain, also in a shed. The total quantity was ample for the feeding for the stipulated period—five months—of the number of cattle that the property was capable of carrying when under natural pasture. The quality of the fodder was good, and it was well protected and conveniently located.

Mr. F. O. Stokes, who won the second prize, is a keen enthusiast on the subject of fodder conservation. His success last year in conserving silage by the trench method, no doubt, influenced others in the district to do likewise, and he himself was so satisfied with the result that he erected a concrete tower silo. This contained 75 tons of maize silage, and to supplement this,

13 tons of lucerne hay was stacked in a shed and 2½ tons of maize grain stored in a barn. The total quantity was not quite sufficient for the requirements of the forty-six head of cattle which was estimated to be the carrying capacity of the property of 200 acres.

The property of Mr. M. M. McBaron, who won third prize, consists of 128¾ acres of river flats of high carrying capacity. His fodders included 74 tons of maize silage conserved in a tower silo constructed of concrete blocks, 8 tons of grass hay in open stack covered with a tarpaulin, and 2 tons of maize grain in sheds. In the aggregate, the quantity was sufficient only for two-thirds of the requirements, and there was an absence of a fodder of good protein content to improve the quality of the ration.

General Comments.

One of the objects of fodder conservation competitions is to encourage dairy farmers to make provision for the feeding of their herds during the winter months, in order to maintain continuity of production. It is therefore gratifying to note that in the championship competition on the south coast, where the competitions have been conducted for a number of years, eight of the eleven competitors had conserved ample fodder for the feeding of their herds for five months during winter and early spring, and had additional reserves to meet any emergency, such as when the scarcity of natural feed necessitated hand-feeding.

Every competitor, in both championship competitions, relied on silage as the bulk portion of his conserved fodders. One feature of the competitions was the increasing popularity of the trench silo, no fewer than six competitors in the south coast championship adopting this method with success for maize silage, either whole or chaffed, and for grass silage. In the report on last year's competition, attention was drawn to the excessive waste that occurred when grass silage was conserved in stacks, and a recommendation was made that the trench method should be adopted. Similar spoiling, amounting from 25 per cent. to a considerably greater proportion, was again experienced in all stacks of silage inspected, due to the exposure of the external surfaces to the air, and those who have substituted the trench method for the stack have been quite satisfied with its advantages and economy.

The objections previously raised that silage could not be successfully conserved in pit silos on the coast, owing to the heavy rainfall, have been found to be without foundation. For some years this method has been adopted with success by a few farmers in south coast districts, and now its suitability under north coast conditions has been demonstrated. Provided care is taken in the selection of a suitable site for the pit, and the filling of the pit completed with a good crown to throw off heavy rains, the pit silo is quite efficient. It is also an advantage to construct shallow drains alongside the pit to carry away surface rain-water. Some difficulty and damage may be caused by water collecting in the pit as the result of heavy rains when the

silo is being emptied, or when empty; in the former case damaging the silage, and in the latter causing the sides of the pit to cave in. There are various methods by which this may be obviated, such as by letting in drain pipes or constructing a rubble drain from the lower end of the silo to carry the water away, but perhaps the best method is to cover the pit with a portable roof made in sections. Where a knoll or hillock is available, a hillside trench silo with the lower end open, is very suitable in districts of heavy rainfall. The open end is boarded-up with planks at the time of filling, and when it is desired to use the silage the planks are removed; there is no danger of water collecting in the pit, and, moreover, the removal of the silage is facilitated.

Every competitor on the south coast and all but two on the north coast recognised maize as the ideal crop for silage. It excels all other fodder crops in the total nutrients produced per acre, but should not be regarded, however, as a perfect ration in itself for feeding to dairy cattle, as it is deficient in protein, and therefore requires to be supplemented with a fodder rich in protein in order to supply a well-balanced ration. For this purpose lucerne hay is considered to be most suitable. It was encouraging to find that all but two competitors in the south coast championship had included lucerne hay in their reserves for combining with maize silage.

The Use of Blood as a Fertiliser.

Blood, as it comes from the animal, is of value as a fertiliser, since it contains about 1¼ per cent. nitrogen. When put on the market as a fertiliser, blood is first dried and then finely ground to powder. This dried blood contains 11 per cent. nitrogen, and is quoted on the Sydney market at £11 per ton.

Blood and bone fertiliser is a mixture of dried blood and crushed bones. Its market value is about £7 per ton, and it contains 4 to 7 per cent. nitrogen and 10 to 17 per cent. phosphoric acid.

In order to manufacture a marketable fertiliser from blood, bones or animal offal, costly plant and machinery for drying, grinding, etc., are required. Blood and bones could be made into a manure for local use in the following simple manner:—

If liquid, the blood should be absorbed in sawdust, earth or litter; if solid, the clotted mass should be mixed with a loamy soil and forked over. The material containing the blood is then mixed with more soil and made into a compost heap in the same way as stable manure is composted. If bones are available they should be steamed to remove the tallow and then ground. If it is not practical to do this, then the bones could be broken up with a sledge hammer and added to the heap along with a couple of bucketsful of wood ashes. More soil should then be added and the heap kept damp, forked over, and allowed to remain for a couple of weeks, or until the material is well decomposed.

At the end of this time the compost should be spread on the land and well dug in. Such material should be a good manure, as it supplies both nitrogen and phosphates to the soil.

Lucerne Cut at Various Stages of Growth.

AN INVESTIGATION AS TO ITS COMPOSITION AND YIELD.

E. GRIFFITH, B.Sc., Chief Chemist, and A. A. RAMSAY, F.C.S., F.A.I.C.,
Late Chief Chemist.

To investigate the composition and yield of lucerne at various stages of growth, viz., (*a*) when about 6 inches high, (*b*) in the "bud stage," and (*c*) in full flower, chemical analyses were made of lucerne cut at these stages of growth at Trangie and Cowra experiment farms. The series included, in the case of Trangie, eight cuts (the first on 2nd September, 1929, and the last on 1st July, 1930) in the "6-inch high stage," eight cuts (the first on 16th September, 1929, and the last on 14th July, 1930) in the "bud stage," and five cuts (the first on 2nd October, 1929, and the last on 4th March, 1930) in the "full flower" stage. The Cowra series included two cuts only (made on the dates shown in the accompanying tables) of each of the three stages.

We are indebted to the experimentalists at those farms for the weight of the lucerne at the various times of cutting.

Tables I to III give the percentage composition of the lucerne expressed on a moisture-free basis, and Tables IV to VI the number of pounds of crude protein, ether extract (fat), fibre, and ash, yielded per acre, in the lucerne cut at the stages (*a*), (*b*), and (*c*).

The Percentage Composition.

Inspection of Table I shows that the percentages of protein, ether extract, etc., in the lucerne cut at each stage vary considerably, amounting to as much as 13 per cent. in protein content, 2 per cent. in ether extract, 5½ per cent. in fibre and ash and 10 per cent. in nitrogen-free extract in Trangie lucerne cut when 6 inches high. The variations that occur are shown in Table II, which has been prepared to show the minimum and maximum content of the constituents in the cuts at the three stages of growth, (*a*), (*b*), and (*c*).

In the case of Trangie lucerne cut when 6 inches high, it will be noted that the percentage of protein is approximately the same in first three cuts, then drops nearly 2 per cent. in the fourth cut; in the fifth cut it is 7.4 per cent. less than in the fourth cut, and it increases 2.4 per cent. in the sixth cut, decreases 2 per cent. in the seventh cut, and increases 13 per cent. in the eighth cut. Fibre and ash content also vary in an irregular manner.

We suggest that these variations and irregularities are probably due more to factors such as climate (and particularly rainfall), than to the "stage of growth" of the lucerne. This would account for the percentage of protein being higher in Trangie lucerne cut in the bud stage than in that cut when 6 inches high, while Cowra lucerne in the bud stage contains 2 per cent. less protein than that cut when 6 inches high.

TABLE I—PERCENTAGE Composition of Lucerne cut at Various Stages of Growth at Trangie and Cowra Experiment Farms.

Cut when 6 inches high.

Locality.	Number of cutting.	Date when cut.	Weight of fresh lucerne per acre.	Weight of lucerne (moisture-free) per acre.	100 parts dry matter contains— Crude protein.	Ether extract.	Fibre.	Ash.	Nitrogen-free extract.
			lb.	lb.					
Trangie	1	2–9–29	1613·3	404·4	29·33	5·24	12·64	15·30	37·49
	2	9–10–29	1310·8	368·8	28·86	3·28	15·50	13·14	38·95
	3	28–10–29	731·0	185·0	28·68	3·83	13·06	13·76	40·67
	4	18–11–29	478·9	130·3	26·80	3·66	11·83	14·30	43·41
	5	18–12–29	378·1	133·9	19·42	3·64	15·39	13·98	47·57
	6	13–1–30	252·1	77·7	21·83	3·88	16·10	14·16	44·03
	7	22–5–30	428·5	116·0	19·71	4·07	14·35	18·81	42·56
	8	1–7–30	1739·3	271·1	32·69	3·39	10·63	16·38	36·91
Average of Trangie	...	...	...	...	25·92	3·87	13·75	15·01	41·45
Cowra	1	2–10–29	1764·5	512·2	27·12	4·12	11·26	15·48	42·02
	2	25–11–29	2495·6	844·0	25·15	3·66	17·88	12·58	40·73
Average of Cowra.	...	...	...	...	26·13	3·89	14·57	14·03	41·38
Average of all	...	...	...	...	25·96	3·88	13·91	14·82	41·43

Cut in bud stage.

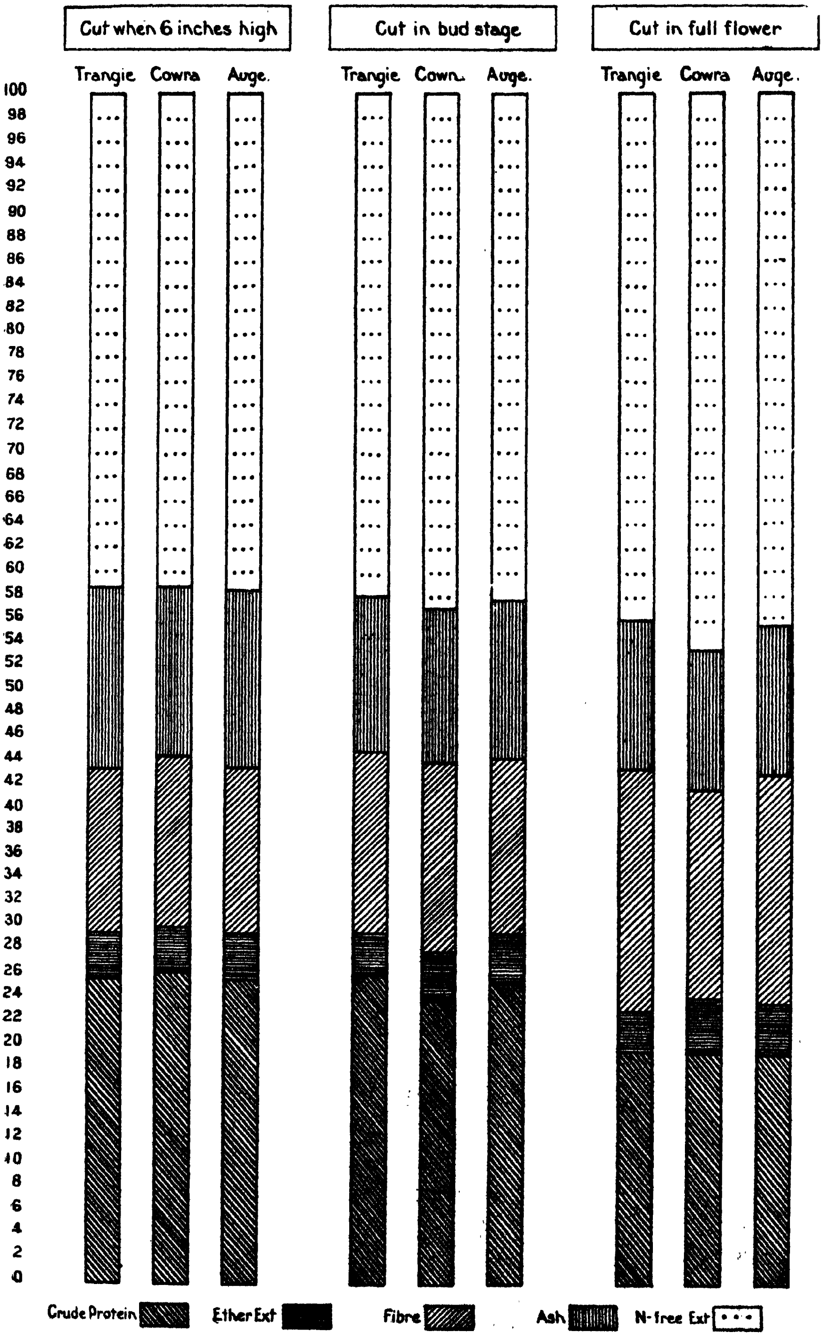
Locality.	Number of cutting.	Date when cut.	Weight of fresh lucerne per acre.	Weight of lucerne (moisture-free) per acre.	100 pounds dry matter contains— Crude protein.	Ether extract.	Fibre.	Ash.	Nitrogen-free extract.
			lb.	lb.					
Trangie	1	16–9–29	2268·7	700·8	25·14	3·46	16·07	13·50	41·83
	2	15–10–29	2067·1	542·4	26·16	2·92	16·98	14·08	39·86
	3	7–11–29	1386·4	391·5	25·92	3·35	16·23	12·48	42·02
	4	11–12–29	504.1	166·1	22·37	4·32	14.17	13·85	45·29
	5	2–1–30	252·1	74·5	24·41	3·60	14·77	13·08	44·14
	6	4–2–30	1008·3	253·5	26·00	3·99	13·13	14·83	42·05
	7	30–5–30	504·1	132·9	26·09	3·99	11·37	15·80	42·75
	8	14–7–30	3125·8	543·5	32·45	3·35	12·97	13·61	37·62
Average of Trangie	...	...	...	...	26·07	3·62	14·46	13·90	41·95
Cowra	1	8–10–29	1436·9	493·5	25·26	4·03	14·85	15·03	40·83
	2	27–11–29	2646·9	866·0	22·69	3·79	17·20	12·15	44·17
Average of Cowra.	...	...	...	...	23·98	3·91	16·02	13·59	42·50
Average of all	...	...	...	...	25·65	3·68	14·77	13·84	42·06

Cut in full flower.

Locality.	Number of cutting.	Date when cut.	Weight of fresh lucerne per acre.	Weight of lucerne (moisture-free) per acre.	100 pounds dry matter contains— Crude protein.	Ether extract.	Fibre.	Ash.	Nitrogen-free extract.
			lb.	lb.					
Trangie	1	2–10–29	3201·4	905·3	22·75	3·15	21·28	12·85	39·97
	2	5–11–29	3302·2	978·7	20·71	3·45	24·63	14·16	37·07
	3	19–12–29	1512·5	537·7	18·31	3·16	20·14	11·98	46·41
	4	21–1–30	655·4	218·5	19·07	4·68	14·84	12·24	49·17
	5	4–3–30	1109·1	415·2	15·15	4·16	21·00	11·23	48·46
	6	...	...	...	...	...	...	...	...
	7	...	...	...	...	...	...	...	...
	8	...	...	...	...	...	...	...	...
Average of Trangie	...	...	...	...	19·20	3·71	20·38	12·49	44·22
Cowra	1	21–10–29	2067·1	746·3	20·63	3·74	15·60	13·02	47·01
	2	10–12–29	2823·3	1076·5	18·96	4·56	19·65	11·04	45·79
Average of Cowra.	...	...	...	...	19·80	4·15	17·62	12·03	46·40
Average of all	...	...	...	...	19·37	3·84	19·59	12·36	44·84

TABLE II—MAXIMUM, Minimum and Range of Percentage Composition of the Various Constituents in the Various Cuts at Different Stages of Growth.

	Cut when 6 inches high.						Cut in bud stage.						Cut when in full flower.					
	Minimum.	Date.	Maximum.	Date.	Range.	Mean for whole series.	Minimum.	Date.	Maximum.	Date.	Range.	Mean for whole series.	Minimum.	Date.	Maximum	Date.	Range.	Mean for whole series.
Trangie Series—																		
Crude protein ...	19·42	18–12–29	32·69	1–7–30	13·27	25·92	25·14	16–9–29	32·45	14–7–30	7·31	26·07	15·15	4–3–30	22·75	2–10–29	7·60	19·20
Ether extract ...	8·28	9–10–29	5·24	2–9–29	1·96	3·87	2·92	15–10–29	4·32	11–12–29	1·40	3·62	3·15	2–10–29	4·68	21–1–30	1·53	3·71
Fibre	10·63	1–7–30	16·10	13–1–30	5·47	13·75	11·37	30–5–30	16·98	15–10–29	5·61	14·46	14·84	21–1–30	24·63	5–11–29	9·79	20·38
Ash	13·14	9–10–29	18·81	22–5–30	5·67	15·01	12·48	7–11–29	15·80	30–5–30	3·32	13·90	11·23	4–3–30	14·16	5–11–29	2·93	12·49
Nitrogen-free extract.	37·49	2–9–29	47·57	18–12–29	10·08	41·45	37·62	4–7–30	45·29	11–12–29	7·67	41·95	37·07	5–11–29	49·17	21–1–30	12·10	44·22
Cowra Series—																		
Crude protein ...	25·15	25–11–29	27·12	2–10–29	1·97	26·13	22·69	27–11–29	25·26	8–10–29	2·57	23·89	18·96	10–12–29	20·63	21–10–29	1·67	19·80
Ether extract ...	3·66	25–11–29	4·12	2–10–29	0·46	3·89	3·79	27–11–29	4·03	8–10–29	0·24	3·91	3·74	21–10–29	4·56	10–12–29	0·82	4·15
Fibre	11·26	2–10–29	17·88	25–11–29	6·62	14·57	14·85	8–10–29	17·20	27–11–29	2·35	16·02	15·60	21–10–29	19·65	10–12–29	4·05	17·62
Ash	12·58	25–11–29	15·48	2–10–29	2·90	14·03	12·15	27–11–29	15·03	8–10–29	2·88	13·59	11·04	10–12–29	13·02	21–10–29	1·98	12·03
Nitrogen-free extract.	40·73	25–11–29	42·02	2–10–29	2·29	41·38	40·83	8–10–29	44·17	27–11–29	3·34	42·50	45·79	10–12–29	47·01	21–10–29	1·22	46·40



Graph 1.—Percentage Composition of Cuts of Lucerne (on moisture-free basis), made at Three Stages of Growth

The averages of all analyses made of Trangie and Cowra lucerne show that the percentage composition of the lucerne cut when 6 inches high, in bud stage, and in full flower, are as follows:—

TABLE III.—AVERAGE Percentage Composition of all Lucerne.

	Cut when 6 inches high.	Cut in the bud stage.	Cut when in full flower.
Crude protein	25·96	25·65	19·37
Ether extract	3·88	3·68	3·84
Fibre	13·91	14·77	19·59
Ash	14·82	13·84	12·36
Nitrogen-free extract	41·43	42·06	44·84
	100·00	100·00	100·00
Nutritive value	76·12	75·99	72·85
Albuminoid ratio...	1 to 1·93	1 to 1·96	1 to 2·76

Compared with lucerne cut when 6 inches high, the protein content of lucerne in the bud stage is very slightly less (actually 1.19 per cent.), but the protein content of lucerne in full flower shows a marked decrease, viz., 25.39 per cent. of that present in lucerne cut when 6 inches high. The fibre content of lucerne cut in the bud stage is 6.18 per cent. more than in lucerne cut when 6 inches high, and when cut in full flower is 40.83 per cent. more.

The nutritive value of lucerne cut when 6 inches high very closely approximates that of lucerne cut in the bud stage, the difference in favour of the former being less than two-tenths of 1 per cent. The albuminoid ratio is much the same in both. When cut in full flower the nutritive value is 4.3 per cent. less than if cut when 6 inches high and the albuminoid ratio is much wider, viz., 1 to 2¾.

The Yields Taken into Consideration.

In Table IV the percentage composition of the lucerne on a moisture-free basis has been correlated with the yield of lucerne harvested per acre, and the number of pounds per acre of crude protein, ether extract, fibre, etc., is given.

Attention is drawn to the very variable yield of lucerne, particularly at Trangie. In the case of lucerne cut when 6 inches high the yield varied from a maximum of 404 lb. dry matter per acre to a minimum of 77.7 lb. per acre. Taking the weight yielded per acre in the first cut made on 2nd September, 1929, as 100, the yields obtained in the second to the eighth cut would be represented by 91.2, 45.7, 32.2, 33.1, 19.2, 28.7, and 67.0, respectively. In the case of Trangie lucerne cut in bud stage the yield of lucerne on a moisture-free basis shows even greater variation, viz., from a maximum of 700.8 lb. at 16th September, 1929, to a minimum of 74.5 lb. at 2nd January, 1930. Taking the yield per acre in the first cut as 100, the yields obtained in the second to eighth cut would be represented by 77.4, 55.9, 23.7, 10.6, 36.2, 19.0, and 77.6, respectively. The greatest variation in yield, viz., 760 lb. per acre, occurred in the case of lucerne "cut in full flower,"

TABLE IV.—POUNDS per acre of Protein, Ether Extract, Fibre, Ash, Nitrogen-free Extract in Lucerne cut at various stages of growth at Trangie and Cowra Experiment Farms.

Cut when 6 inches high. (Number of lb. obtained per acre.)

Locality.	Number of cuttings.	Date when cut.	Lucerne (fresh).	Lucerne (moisture-free).	Crude protein.	Ether extract.	Fibre.	Ash.	Nitrogen-free extract.
Trangie	1	2–9–29	1613·3	404·4	118·6	21·2	51·1	61·9	151·6
	2	9–10–29	1310·8	368·8	106·4	12·1	57·2	49·5	143·6
	3	28–10–29	731·0	185·0	53·1	7·1	24·2	25·5	75·1
	4	18–11–29	478·9	130·3	34·9	4·8	15·4	18·6	56·6
	5	18–12–29	378·1	133·9	26·0	4·9	20·6	18·7	63·7
	6	13–1–30	252·1	77·7	17·0	3·1	12·5	10·8	34·3
	7	22–5–30	428·5	116·0	22·9	4·7	17·2	21·8	49·4
	8	1–7–30	1739·3	271·1	88·6	9·2	28·8	44·4	100·1
Total of Trangie		...	6932·0	1687·2	467·5	67·1	227·0	251·2	674·4
Cowra	1	2–10–29	1764·5	512·2	138·9	21·1	57·7	79·3	215·2
	2	25–11–29	2495·6	844·0	212·3	30·9	150·9	106·2	343·7
Total of Cowra.		...	4260·1	1356·2	351·2	52·0	208·6	185·5	558·9
Total of all.		...	11192·1	3043·4	818·7	119·1	435·6	436·7	1233·3

Cut in bud stage. (Number of lb. obtained per acre.)

Locality.	Number of cuttings.	Date when cut.	Lucerne (fresh).	Lucerne (moisture-free).	Crude protein.	Ether extract.	Fibre.	Ash.	Nitrogen-free extract.
Trangie	1	16–9–29	2263·7	700·8	176·2	24·2	112·6	94·6	293·2
	2	15–10–29	2067·1	542·4	141·9	15·8	92·1	76·4	216·2
	3	7–11–29	1386·4	391·5	101·5	13·1	63·5	48·9	164·5
	4	11–12–29	504·1	166·1	37·2	7·2	23·5	23·0	75·2
	5	2–1–30	252·1	74·5	18·2	2·7	11·0	9·7	32·9
	6	4–2–30	1008·3	253·5	65·9	10·1	33·3	37·6	106·6
	7	30–5–30	504·1	132·9	34·7	5·3	15·1	21·0	56·8
	8	14–7–30	3125·8	543·5	176·4	18·2	70·5	74·0	204·4
Total of Trangie		...	11116·6	2805·2	752·0	96·6	421·6	385·2	1149·8
Cowra	1	8–10–29	1436·9	493·5	124·6	19·9	73·3	74·2	201·5
	2	27–11–29	2646·9	866·0	196·5	32·8	148·9	105·2	382·6
Total of Cowra.		...	4083·8	1359·5	321·1	52·7	222·2	179·4	584·1
Total of all.		...	15200·4	4164·7	1073·1	149·3	643·8	564·6	1733·9

Cut in full flower. (Number of lb. obtained per acre.)

Locality.	Number of cuttings.	Date when cut.	Lucerne (fresh).	Lucerne (moisture-free).	Crude protein.	Ether extract.	Fibre.	Ash.	Nitrogen-free extract.
Trangie	1	2–10–29	3201·4	905·3	206·0	28·5	192·6	116·3	361·9
	2	5–11–29	3302·2	978·7	202·7	33·6	241·1	138·6	362·7
	3	19–12–29	1512·5	537·7	98·4	17·0	108·3	64·4	249·6
	4	21–1–30	655·4	218·5	41·7	10·2	32·4	26·7	107·5
	5	4–3–30	1109·1	415·2	63·0	17·3	87·2	46·6	201·1
	6	...	...	...	...	...	...	...	...
	7	...	...	...	...	...	...	...	...
	8	...	...	...	...	...	...	...	...
Total of Trangie		...	9780·6	3055·4	611·8	106·6	661·6	392·6	1282·8
Cowra	1	21–10–29	2067·1	746·3	153·9	27·9	116·5	97·2	350·8
	2	10–12–29	2823·3	1076·5	204·2	49·1	211·5	118·8	492·9
Total of Cowra.		...	4890·4	1822·8	358·1	77·0	328·0	216·0	843·7
Total of all.		...	14671·0	4878·2	969·9	183·6	989·6	608·6	2126·5

ranging from a maximum of 978.7 lb. per acre as at 5th November, 1929, to a minimum of 218.5 lb. at 21st January, 1930. Taking the weight of dry matter per acre in first cut as 100, subsequent cuts would be represented by 108.1, 59.4, 24.1, and 45.9, respectively.

It is understood that in the case of lucerne grown at Trangie and cut in "full flower" stage, no further sample was procurable after 4th March, 1930, and that after that date little or no further growth occurred. If so, the following tabular statement (Table V) might reasonably be taken as representing the nutritional value of lucerne grown and harvested under the three systems, (*a*), (*b*), and (*c*). The first two would represent a 301-day period, and the last a 308-day period.

TABLE V.—AVERAGE Amount (lb. per acre) of Protein, Fat, Fibre, etc., in Lucerne Grown at Trangie, Cut at Various Stages of Growth.

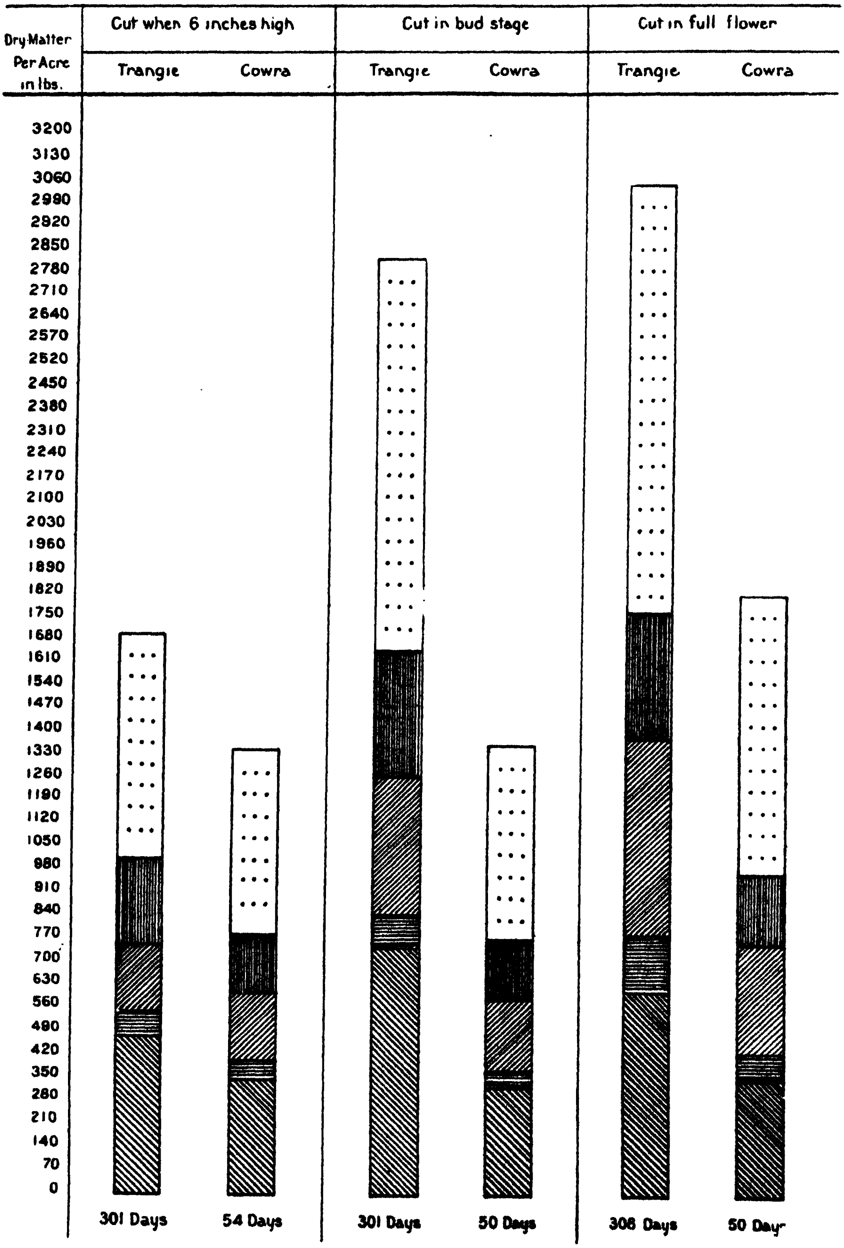
	Cut 6 inches high.	Cut in bud stage.	Cut in full flower stage.
Protein	467·5	752·0	611·8
Ether extract	67·1	96·6	106·6
Fibre	227·0	421·6	661·6
Ash	251·2	385·2	392·6
Nitrogen-free extract	674·4	1,149·8	1,282·8
Total dry matter ...	1,687·2	2,805·2	3,055·4
Nutritive value	1,292·9	2,119·2	2,134·5
Albuminoid ratio...	1 to 1·76	1 to 1·82	1 to 2·49

The results from Trangie Farm show that during the period of experiment (301 to 308 days) lucerne cut when 6 inches high contained 1,687.2 lb. dry matter with an albuminoid ratio of 1 to 1.76. When cut in bud stage, 2,805.2 lb. dry matter was obtained (an increase of 63.9 per cent.) with an albuminoid ratio of 1 to 1.82. When cut in full flower, 3,055.4 lb. dry matter was obtained, an increase of 81.1 per cent., as compared with yields at 6 inches high; the albuminoid ratio was 1 to 2.49.

The mean of the results at both farms (Trangie and Cowra) is summarised in Table VI.

TABLE VI.—AVERAGE Amount (lb. per acre) of Protein, Fat, Fibre, etc., Over all Trials, in Lucerne Cut at Various Stages of Growth.

	All trials cut when 6 inches high.	All trials in bud stage.	All trials in full flower.
Protein	818·7	1,073·1	969·9
Ether extract	119·1	149·3	183·6
Fibre	435·6	643·8	989·6
Ash	436·7	564·6	608·6
Nitrogen-free extract	1,233·3	1,733·9	2,126·5
Total dry matter ...	3,043·4	4,164·7	4,878·2
Nutritive value	2,320·0	3,142·9	3,509·5
Albuminoid ratio...	1 to 1·83	1 to 1·93	1 to 2·62



[For Key see Graph 1.]

Graph 2.—Pounds per Acre of Constituents of Cuts of Lucerne (moisture-free basis), made at Three Stages of Growth.

The results from all trials show that lucerne cut when 6 inches high yielded 3,043.3 lb. per acre dry matter with an albuminoid ratio of 1 to 1.83. When cut in bud stage 4,164.7 lb. dry matter was obtained (an increase of 36.8 per cent.), having an albuminoid ratio of 1 to 1.93. When cut in full flower 4,878.2 lb. dry matter was obtained (being an increase of 60.3 per cent. as compared with lucerne 6 inches high); the albuminoid ratio was 1 to 2.62.

The Stock Carrying Capacity at Each Stage.

So far as stock feeding is concerned, there is no doubt from the data supplied that 36 per cent. more stock could be fed with lucerne cut in the bud stage than if cut when 6 inches high; the albuminoid ratio of both lucernes would be practically the same. It appears probable that if the lucerne were cut in full flower, 60 per cent. more stock could be fed, although the albuminoid ratio of this lucerne would be slightly wider, viz., 1 to 2.62.

Summary.

The percentage composition of lucerne grown at Trangie and Cowra experiment farms, cut at three stages of growth, has been determined. The average of all analyses show:—

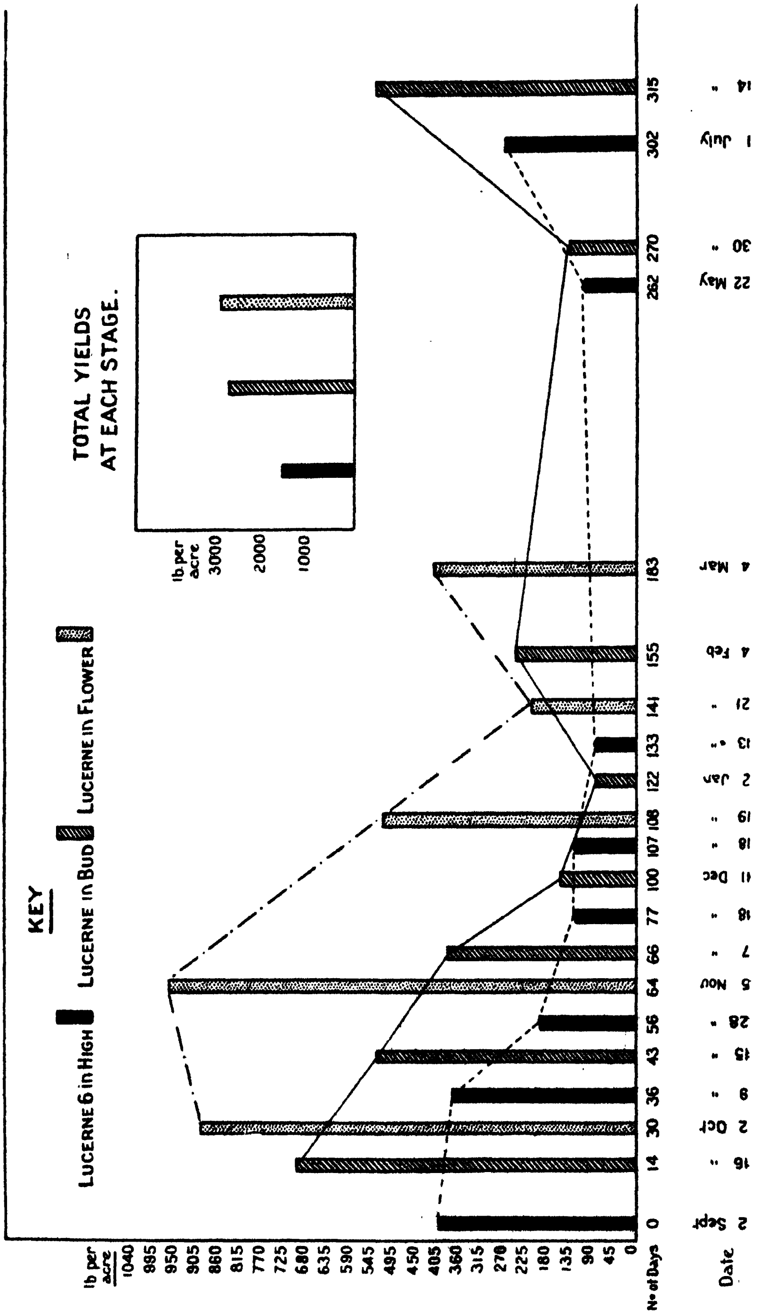
1. Protein content is highest in lucerne cut when 6 inches high, is very slightly less (1.2 per cent.) in lucerne cut in bud stage, and markedly less (25.4 per cent.) in lucerne cut when in full flower. The percentages of protein at the three stages of growth are 25.96, 25.65, and 19.37, respectively.

2. Fibre content is lowest in lucerne cut when 6 inches high. When in bud stage this amount is increased by 6.2 per cent. Fibre is highest when lucerne is in full flower and is then 40.8 per cent. more than when lucerne is 6 inches high. The percentages of fibre present at the respective stages of growth are 13.91, 14.77, and 19.59.

3. Ash content is highest in lucerne cut when 6 inches high, and decreases to 6.6 per cent. of this amount when in the bud stage. When in full flower the decrease in ash content is marked, being 16.6 per cent. of that present when the lucerne is 6 inches high. The ash content at the respective stages of growth is 14.82, 13.84, and 12.36 per cent.

4. The "nutritive value" of each hundred pounds dry matter in lucerne cut when 6 inches high closely approximates that of lucerne cut in the bud stage, the difference in favour of the former being less than two-tenths of 1 per cent. The albuminoid ratio is approximately the same in both, viz., 1 to 1.93 and 1 to 1.96. When cut in full flower the nutritive value is 4.3 per cent. less than in lucerne cut when 6 inches high, and the albuminoid ratio is wider, viz., 1 to 2¼. The "nutritive values" at the three stages of growth are 76.12, 75.99, and 72.85, respectively.

In the foregoing, consideration has only been given to the percentage composition of the lucerne cut at various stages of growth; but in order that any possible economic advantages from cutting the lucerne at these



Graph 3.—Yield in Pounds per Acre of Cuts of Lucerne (moisture-free basis), made at Three Stages of Growth.

[Inset shows total yield at each stage.]

various stages of growth might be demonstrable and adequately compared, it is necessary to correlate the percentage composition with the actual yields of lucerne obtained per acre. When this is done it is seen that—

1. Lucerne cut when 6 inches high yielded 3,043.3 lb. per acre dry matter with an albuminoid ratio of 1 to 1.83. When cut in the bud stage, 4,164.7 lb. dry matter was obtained (an increase of 36.8 per cent.), having an albuminoid ratio of 1 to 1.93. When cut in full flower 4,878.2 lb. dry matter was obtained (being an increase of 60.3 per cent. compared with lucerne cut 6 inches high) and the albuminoid ratio was 1 to 2.62.

2. Approximately one-third (36 per cent.) more stock could be fed on lucerne cut in the bud stage than if cut when 6 inches high. The albuminoid ratio of both lucernes would be practically the same.

The lucerne cut in full flower would feed 60 per cent. (nearly two-thirds) more stock than if cut when 6 inches high, but the albuminoid ratio in this lucerne would be slightly wider, viz., 1 to 2.62.

No Fortune in By-products from Straw.

It has been brought under the notice of the Department of Agriculture that attempts are being made to interest farmers in proposals for the utilisation of straw, and apparently extravagant claims are being made in regard to the returns that may be expected.

Realising the advantages that would accrue to farmers if straw could be profitably utilised, the Department has been investigating the problem for some considerable time with a view of ascertaining whether anything could be done in this direction. It is true that motor spirit, paper, fertilisers, and other by-products can be made from straw. The value of some of these products, notably fertiliser, is a very doubtful quantity when considered in relation to the cost of distribution, while the production and distribution costs in regard to others such as motor spirit give little hope that they can compete with other products such as petrol that are already established on the market.

In other countries where the crop is reaped and threshed and the straw stacked ready for utilisation, attempts have been made to utilise it profitably, but, except for minor uses such as the making of straw envelopes and strawboard, very little success has been achieved, and the material is not used on a commercial scale. The costs of production are increased under our local conditions by the methods of harvesting. In Australia the grain is stripped from the straw in the field and to utilise straw for the manufacture of by-products it would be necessary to gather it at considerable expense.

While it is the Department's desire to do whatever is possible to increase farmers' returns and to explore every avenue that may give promise in this direction, it is felt that farmers should be protected and the best advice placed at their disposal when they are considering schemes that may be presented to them. In regard to the utilisation of straw, it is considered that the utmost caution should be exercised by farmers, and, before investing in any proposition of this nature, they would be well advised to communicate with the Department.

Large Stocks of Wheat still in Silos—Minister's Warning.

The Minister for Agriculture (Hon. Hugh Main, M.L.A.) views with some concern the relatively large amount of wheat at present on hand in the silos, as, unless these stocks are very substantially reduced before the new season's wheat is harvested, growers in many cases are likely to experience considerable inconvenience and expense through inability to receive their wheat at the elevators when it is ready for delivery.

From figures supplied to the Minister it appears that the stocks of bulk wheat at present held in the silos amount to nearly nine million bushels as against only six and a quarter million bushels for the corresponding period last year, and whereas in July, 1931, eight shipments totalling over forty-six thousand tons were loaded from the terminal, during the same month this year only two shipments amounting to about fourteen thousand seven hundred tons have been made.

The Minister points out that the elevator system in this State has been designed to handle wheat of the current season, and surplus storage is not provided to enable wheat of one harvest to be carried over into the succeeding season. Owing to the heavy demands on the storage space by deliveries made during the harvesting period, it is evident that if the elevators have to carry over into the new season a large stock of last season's wheat, the system will not be capable of accommodating new grain to the same extent as last year, and it is certainly unreasonable to expect that growers should be forced to incur extra expense in purchasing cornsacks for bagging their wheat, because of the action of others in holding old season's wheat in the elevators for speculative purposes.

The Minister emphasises that storage fees at the rate of one-eighth of a penny per bushel are charged for each week that wheat is left in the elevators after 31st July, and persons who are holding wheat in the silos in the hope of securing higher returns would do well to bear this in mind. It is also pointed out that the manager of the elevators has power, under the Wheat Act, to dispose of any wheat of which delivery has not been taken within twelve months after its receipt. Unless the position shows considerable improvement, serious consideration will have to be given to the question of increasing the storage charge in future.

Bulk Trucks for Non-silo Stations.

The Minister for Agriculture (Hon. Hugh Main, M.L.A.) has recently had under consideration numerous requests from centres in the southern and western wheat districts to be allowed a share of the bulk trucks which were to be reserved up till 21st November for the north and north-western districts only. It has now been decided that, where practicable, non-silo stations in these western and southern districts may be allowed a share of the bulk trucks which will be available up to that date. No extension beyond 21st November can be granted, however, as the capacity at the Sydney terminal elevator is limited and provision must be made for the overflow from silo stations. In this connection, it is explained that most of the country plants are filled and emptied by clearances to the terminal elevator on numerous occasions and in one instance last year a silo was emptied eighteen different times.

Potato Crop Competitions, 1931-32.

SOUTHERN AND WESTERN DISTRICTS.

A. J. PINN, H.D.A., Special Agricultural Instructor.

POTATO crop competitions were carried out in 1931–32 at eight centres (four in each of the western and southern districts) as follows :—Orange (20 entries), Millthorpe (19 entries), Blayney (18 entries), Oberon (13 entries), making a total for the western district of 70 entries; Crookwell (60 entries), Batlow (43 entries), Taralga (33 entries), Berrima (6 entries), making a total for the southern district of 142 entries, and a grand total of 212 entries, which exceeded the number last year by 30, or 15 in each district. Chiefly as the result of frost damage, a number of crops were withdrawn before the final judging, at which 131 crops were judged. Blayney Society conducted its initial competition.

The R.A.S. Championships.

The Royal Agricultural Society again organised a championship competition for a silver cup in each of these districts, for which all the winners of the local competitions competed, each complying with the requirement that competitors shall have at least 5 acres under potatoes on his farm.

The points awarded in the championship competitions were as follows :—

AWARDS in District Championship Competitions.

Competitor and Society.	Variety.	Yield per acre.	Points awarded. Yield (5 points per ton).	Quality. Appearance.	Quality. Cutting.	Freedom from disease. Tops.	Freedom from disease. Tubers.	Purity.	Allowance for previous cropping.*	Total points.
Maximum points ...	......	...	...	15	15	8	7	15	...	...
		t. cwt.								
Western District Championship.										
M. Hiney, Orange ...	Late Manhattan.	10 0	50	14	14	7¾	6¾	14½	4	111
P. A. Kingham, Millthorpe.	Factor ...	10 2	50½	13	13	7½	6¾	15	2	107¾
A. G. Kingham, Blayney.	„ ...	9 10	47½	12¾	13¼	8	6¾	15	...	103¼
R. Spencer, Oberon ...	Satisfaction	4 3	20¾	14¼	12½	5	6½	15	1	75
Southern District Championship.										
Conlon Bros., Berrima.	Early Rose	11 4	56	13¼	14½	7	6¾	15	5	117½
J. A. Bartell, Batlow ...	Factor ...	9 12	48	13	12	8	6½	15	...	103¼
Lowe Bros., Crookwell.	„ ...	9 6	46½	13	12¾	6	6[illegible]	15	2	102¾
A. J. O'Brien, Taralga...	„ ...	8 10	42½	13	13¼	7½	6½	15	...	100¾

* One point allowed for each crop of potatoes grown during the previous ten years, with a maximum of 5 points.

Orange District Competition.

The competition conducted by the Orange Agricultural and Pastoral Association was divided into two sections, viz., coloured-skin and white-skin. Seven plots (six of Late Manhattan and one of Early Manhattan) were submitted for final judging in the former and eight (all of Factor) in the white-skin section.

The seven coloured-skin entries averaged a little over 6 tons 8 cwt., while the eight Factor plots yielded an average of 6 tons 13 cwt. The outstanding feature of this competition was the great improvement of the Factor entries as compared to last year, every competitor having obtained a better strain of this variety. The fact that such good strains are now available on most of these farms should be responsible for an increase in acreage production. The appearance of the potatoes was most gratifying, as was the cutting quality for the most part, no doubt, as the result of the tubers being formed late in the season after the hot weather and of the relatively dry conditions at lifting time.

In some areas the percentage of scab on the tubers was rather high, and attention should be given to seed treatment. It was noticeable that the newer growths were much cleaner than those formed early in the season.

Details of the points awarded the winners are set out in the following table:—

AWARDS (of Leading Competitors only) in the Orange Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points Awarded. Yield.	Quality. Appearance.	Quality. Cutting.	Freedom from Disease. Tops.	Freedom from Disease. Tubers.	Purity.	Allowance for previous cropping.	Total.
			t. cwt.								
Coloured-skin Section.											
M. Hiney ...	Late Manhattan.	31¾	10 0	50	14	14	7¾	6¾	14½	4	111
Ginn Bros. ...	,, ...	32	10 7	51¾	12	12	7¾	5¾	15	...	104¼
T. Fuller ...	,, ...	27¾	7 18	39½	13¾	14	7¾	6½	14¾	5	101¼
White-skin Section.											
T. Fuller ...	Factor ...	29	9 12	48	13¼	13¼	7¼	6¾	15	5	108½
M. Hiney ...	,, ...	35	7 18	39½	12½	13¼	7¾	5½	15	4	97½
K. Bowen ...	,, ...	38	7 6	36½	12¾	13	7	6½	15	2	92¾

Mr. M. Hiney, of "Riversdale," won first prize in the coloured-skin section with a crop of Late Manhattan, which yielded 10 tons per acre of tubers of excellent appearance and good cutting quality, and scored 111 points, the highest in both sections.

The previous crop was oats, which were preceded by a crop of potatoes. The plot was first ploughed on 4th August, after the area had been given a

dressing of stable manure, and was harrowed prior to the second ploughing late in November and again before planting on 15th December. Cut seed was used, and was dropped by hand after the plough, a proprietary potato fertiliser at 6 cwt. per acre being applied in the furrows. The crop was harrowed after planting, and later was inter-row cultivated.

Mr. M. Hiney's Champion Crop of Late Manhattan.

Messrs. Ginn Bros. Crop of Late Manhattan.

Second place in this section was awarded to Messrs. Ginn Bros. for a crop of Late Manhattan, which yielded at the rate of 10 tons 7 cwt., the highest in the competition. Portion of this crop was planted with a poorer strain of the variety, and the yield was considerably reduced, while late rains resulted in a good deal of second growth, which caused loss of points for appearance and cutting quality.

D

The first ploughing was carried out on 1st August, and the plot was harrowed twice before the second ploughing during the first week of October. Both whole and cut seed were used for planting on 18th November by dropping after the plough. The crop was harrowed when breaking through the ground and inter-row cultivated during December.

Mr. T. Fuller won first prize in the white skin section, his crop of Factors, which yielded at the rate of 9 tons 12 cwt. per acre, being of excellent appearance and cutting quality and securing 108½ points.

The previous cropping of the area was wheat alternated with potatoes for some years past. The plot was first ploughed during the first week of August and immediately harrowed and was disc ploughed in the second week in November, two harrowings being given before planting on 15th December. Whole seed of 2 to 2½ oz. was dropped off the plough and the fertiliser applied consisted of a mixture of 3 cwt. superphosphate and 1 cwt. of sulphate of potash per acre. The area was harrowed after planting and again early in January after rain.

It was unfortunate that the plot entered by Mr. M. Hiney, who won second place, was planted prior to the heavy rain of early December, for the soil was compacted, which no doubt considerably reduced the yield and affected the appearance of the tubers. The previous crop was oats, which followed peas. The first ploughing was given on 15th August, and the area harrowed, ploughed and harrowed again before planting on 17th November with cut seed, the seed and fertiliser (special potato mixture at 6 cwt. per acre) being dropped in the furrow after the plough. After-cultivation consisted of a harrowing ten days from planting and a hand hoeing (owing to the very close planting) during the growing period.

The Millthorpe Competition.

Sixteen of the original nineteen entries in the competition conducted by the Millthorpe A.H. and P. Association were submitted for final judging. Thirteen plots were of Factor variety and three of Early Manhattan, and the average yield of the plots constitutes a record for any competition of more than ten entries judged during the past six years, being 7 tons 6 cwt. per acre. The Factor plots gave the high average yield of 7 tons 16 cwt. per acre, and the Early Manhattans an average of 5 tons 3 cwt. per acre.

These yields reflect the great care and attention paid to the elimination of "off type" and diseased plants and to cultivation methods. Most of the competitors are members of the local association, which controls the sale of certified seed, and which requires a high standard in regard to freedom from virus disease and wilt, as well as in grading.

A hot, dry spell was experienced during the whole of January and most of February, but good rains were received in March and the absence of early frosts enabled the crops to produce satisfactory yields.

The quality of the potatoes generally was very satisfactory, but in a few instances some "stag ends" and a little grub injury were noticed.

Details of the points awarded the winners are given in the following table:—

AWARDS (of Leading Competitors only) in the Millthorpe Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.		Points Awarded.							
					Yield.	Quality.		Freedom from Disease.		Purity.	Allowance for previous cropping.	Total.
						Appearance.	Cutting.	Tops.	Tubers.			
			t.	cwt.								
P. A. Kingham	Factor ...	26	10	2	50½	13	13	7½	6¾	15	2	107¾
P. A. Kingham	" ...	19¾	9	8	47	13	13¼	7½	6¾	15	1	103½
J. Moad and Sons	" ...	27	9	6	46½	13	13	8	6¾	15	1	103¼

Mr. P. A. Kingham, of "The Wattles," secured first and second places with crops of Factor. For two years prior to the planting of the winning crop the area had grown oats and rape, which were fed off. First ploughing

An Entry in the Millthorpe Competition.

was carried out during the last week in August and before planting on 18th November the area was harrowed twice and springtooth cultivated, and a fertiliser mixture of 2 cwt. superphosphate and ½ cwt. sulphate of ammonia per acre applied by drill. Whole 2 to 3 oz. seed was used. After planting the plot received two harrowings (in December) and was horse hoed in January.

The plot which was awarded second place was first ploughed on 25th August, following a crop of barley utilised for feed. Three harrowings and a second ploughing (in October) were given before planting with cut seed on 13th November. No artificial fertiliser was used, but the land was given a dressing of wood ashes and a little stable manure. After-cultivation consisted of two harrowings in December and a cultivation in January.

Messrs. J. Moad and Sons obtained third prize with a crop of Factor. The land, which had been devoted to grazing for the previous five years, was ploughed towards the end of August and worked five times before planting with " one cut seed " on 23rd November. A proprietary fertiliser at 3 cwt. per acre was applied with a combine prior to planting. The after-cultivation consisted of a harrowing when the crop was breaking through the ground and a cultivation during January.

Blayney Competition.

Only five of the original eighteen competitors submitted entries for final judging in the first potato crop competition conducted by the Blayney A. and P. Association, the withdrawals being largely due to unfavourable weather conditions, but also to the realisation by many that their strain of seed was not up to competition standard.

The details of the points awarded the winners are set out in the following table:—

AWARDS (of Leading Competitors only) in the Blayney Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points Awarded.							
				Yield.	Quality.		Freedom from Disease.		Purity.	Allowance for previous cropping.	Total.
					Appearance.	Cutting.	Tops.	Tubers.			
			t. cwt.								
A. G. Kingham	Factor ...	24½	9 10	47½	12¾	13¼	8	6¾	15	...	103¼
A. G. Kingham	Early Manhattan.	25¼	6 4	31	13½	14	7¾	6½	15	...	87¾
W. Burns ...	Factor ...	27½	6 19	34¾	12¼	12	7	5½	15	...	86½

The crop of Factor entered by Mr. A. G. Kingham, of " Athol," Blayney, which was awarded first place, yielded 9 tons 10 cwt. per acre and secured 103¼ points. It was grown on land which had not been cropped for the previous twenty years. The first ploughing was given during the second week in September and the area was worked three times prior to planting with whole 1 to 1½ oz. seed on 27th November, by dropping the sets between the first and second furrows at ploughing. Superphosphate at 2 cwt. per acre was applied with a drill on 18th November. After-cultivation consisted

of harrowing on 10th December, a cross harrowing on 18th December and a cultivation between the rows after the crop had been severely damaged by hail during the first week of February.

The same grower secured second place with a crop of Early Manhattans, which received very similar cultural treatment to the winning crop.

Third prize was awarded to Mr. W. Burns, " Goongirwarrie," Carcoar-road, for a crop of Factor which received 86½ points. This plot was first ploughed in October, 1930, and again ploughed in June and in October, 1931. It was planted with whole 2 oz. seed on 27th November by dropping off the plough, the fertiliser used consisting of 2 cwt. superphosphate and ½ cwt. sulphate of ammonia per acre. The area was harrowed after sowing and again two weeks later after rain.

The Oberon Competition.

Notwithstanding the very dry and hot conditions in the early part of the growing season, a number of the crops entered in the competition conducted by the Oberon Agricultural Society had made satisfactory growth to the time of first judging, but the heavy frosts in February caused a severe setback from which little recovery was noticed even though useful rains were recorded. The general run in size of the tubers was seed size and only one crop gave a yield of over 4 tons per acre. The very hot summer favoured the development of a larger percentage of wilt-infected plants than usual.

Details of the points awarded the winners are given in the following table :—

AWARDS (of Leading Competitors only) in the Oberon Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points Awarded.							
				Yield.	Quality.		Freedom from Disease.		Purity.	Allowance for previous cropping.	Total
					Appearance.	Cutting.	Tops.	Tubers.			
			t. cwt.								
R. Spencer ...	Satisfaction	30	4 3	20¾	14¼	12½	5	6½	15	1	75
C. W. Hawke ...	,, ...	24	1 19	9¾	13¾	12¾	7½	6½	15	...	65¼
J. S. Hawkes ...	Redsnooth	18	2 2	10½	13¼	12½	7	6	15	...	64¼

Mr. Roy Spencer, who won the competition, selected an area of basalt country, which was ploughed in August, and before planting on 16th November was harrowed twice. Both cut and whole seed were used and dropped in the furrows by hand. The fertiliser used in the furrows consisted of a mixture of 2 cwt. superphosphate and ½ cwt. sulphate of ammonia per acre. After-cultivation consisted of one harrowing and one inter-row cultivation.

The cutting quality was somewhat disappointing, no doubt due to the unfavourable weather conditions, but the crop was a very even one.

Crookwell District Competition.

Of the original sixty entries in the competition conducted by the Crookwell A. P. and H. Society, twenty-two were withdrawn, the bulk of them from the immediate vicinity of Crookwell, chiefly because of frost damage and the dry weather conditions experienced during the summer.

The season was a very severe one, commencing with exceedingly wet conditions in the winter and spring (which interfered with soil preparation), while one of the hottest and driest summers on record followed. No useful rain fell until late in the season and February frosts were fairly general. Despite these conditions it is pleasing to record that many fine crops were harvested and that the average yield of the thirty-eight crops submitted for final judging was 4 tons 15 cwt.

Mr. A. Gorman's Plot at Crookwell.

For the most part the tubers were of excellent appearance and quality—the best in these respects yet seen in this district—though " stag ends " and " staggy " tubers were in evidence in some crops, but not to the extent that might have been expected with conditions such as were experienced in the early portion of the growing period.

I would suggest that " fork selection " of outstanding roots be carried out by growers who do not already adopt this practice. It is advisable, however, that the roots selected be not those of the late Factor variety which appears from time to time in most crops.

Scab was prevalent in varying degree. A number of growers in the Bannister district dipped the bulk of their seed with satisfactory results; in some cases the very scabby unsaleable seed was dipped in corrosive sublimate and produced practically clean crops, and the cost of approximately 6d. per bag was more than justified.

FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

Departmental herds include the following Stud Bulls :—

Guernsey : HOPEFUL OF WOLLONGBAR (499), Champion, R. A. Show, Sydney, 1928. *Ayrshire :* SCOTTISH PRIDE OF GOWRIE PARK (3797), First and Champion, R. A. Show, Sydney, 1927 ; First and Reserve Champion, R. A. Show, Sydney, 1928. *Milking Shorthorn :* MORNING STAR OF DARBALARA (Vol 8), Second, R. A. Show, Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522.5 lb. milk, 1,614.1 lb. butter fat in 365 days. *Jersey :* FINVOY GOLDEN NOBLE (imp. N.Z., Vol. 15).

The Department has for sale young bulls from tested dams of the following breeds :—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

Application should be made to—THE UNDER SECRETARY, Department of Agriculture, SYDNEY

There was wide variation in the distance of planting, and in view of the success of so many of the closely-planted plots, it would appear that growers should plant at least twenty-eight rows to the chain. This would allow the area to be reduced without reducing the aggregate yield.

The points awarded the place-getters are given in the following table:—

AWARDS (of Leading Competitors only) in the Crookwell Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points Awarded.							
				Yield.	Quality.		Freedom from Disease.		Purity.	Allowance for previous cropping.	Total.
					Appearance.	Cutting.	Tops.	Tubers.			
			t. cwt.								
Lowe Bros. ...	Factor	30¼	9 6	46½	13¾	12¾	6	6¾	15	2	102¾
M. McDonald ...	,, ...	38	8 7	41¾	13¾	13¼	7¼	6¾	15	...	97¾
A. Gorman ...	,, ...	29	7 15	38¾	13½	12¾	7¾	6	15	...	93¾

Messrs. Lowe Bros. of Roslyn secured first place with a very fine crop of Factor, which gave the very creditable yield of 9 tons 6 cwt. per acre. The first ploughing was carried out on 1st June and the land allowed to lie in the rough till it was harrowed on 6th July. It was again ploughed on 25th September and harrowed twice before sowing on 24th November with seed partly cut; superphosphate at 3 cwt. per acre was applied in the drill. The plot was harrowed twice after planting and again after the tops had broken through the ground. One cultivation was given about flowering time.

Messrs. Lowe Bros. have effected a big improvement in the standard of their potatoes during the past few years by selection and the introduction of "new blood"—perhaps best indicated by the fact that a few years ago they occupied the lowest position in the competition.

Mr. M. McDonald followed up last year's success by securing second place this year. The first ploughing was given in September, and, after two harrowings, the plot was sown on 9th November. Stable manure was spread before planting and superphosphate at 2 cwt. per acre was distributed along the furrows. After-cultivation consisted of two harrowings—one when the crop was breaking ground.

Third place went to Mr. A. Gorman, of Bannister, for a crop of Factor grown on new ground, which was first ploughed in mid-August, and harrowed four times before planting on 15th November. Superphosphate at 3 cwt. per acre was applied with the drill before planting. The plot was harrowed twice after planting and again when the crop was breaking through the ground.

Batlow Agricultural Bureau Competition.

As in past seasons the competition conducted by the Batlow branch of the Agricultural Bureau was divided into two sections, viz., white-skins and coloured-skins.

Of the original forty-three entries, ten were irrigated because of the dry summer and became ineligible to compete, and others were withdrawn chiefly as the result of frost damage. The seventeen crops judged in the white-skin section averaged a yield of 6 tons 5 cwt. per acre and the five in the coloured-skin section, 5 tons 4 cwt.—very satisfactory yields considering the season.

The general standard of the Factor variety was very good, and the tubers were of excellent appearance being free of scab, with the exception of four acres. Two samples of white-skins from "Ardrossan" were of a much whiter colour than the remainder, though the cutting quality generally was uniform and relatively good.

The appearance of the tubers in the coloured-skin section was fairly satisfactory, but the Satisfaction variety throughout showed much ill-shape due to cracking of the tubers, to which fault this variety is prone when tuber formation is rapid, as was the case this year. The Early Manistee entry proved the best in cutting quality, though the sample was not otherwise of the usual standard of this variety, the season not being suited to this early maturer, while Redsnooth was the next best in cutting quality, color and texture being excellent, though odd tubers were inclined to "hollow heart."

Several competitors spaced the rows too wide apart; despite the dry summer the results from the plots did not indicate that close planting was detrimental. Because of the large local business in seed, growers would be wise to give greater consideration to closer planting in an endeavour to produce a greater proportion of tubers of seed size.

The points awarded the winners are given in detail in the following table:—

AWARDS (of Leading Competitors only) in the Batlow Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points Awarded. Yield.	Quality. Appearance.	Quality. Cutting.	Freedom from Disease. Tops.	Freedom from Disease. Tubers.	Purity.	Allowance for previous cropping.	Total.
			t. cwt.								
			White-skinned Section.								
J. A. Bartell ...	Factor ...	30	9 12	48	13	12¾	8	6½	15	...	103¼
H. Hutton ...	,, ...	20	8 9	42½	13	12¾	7	4½	15	...	94½
C. Barberie ...	,, ...	21½	7 4	36	13¼	12¾	8	6¾	15	2	94¼
			Coloured-skin Section.								
C. Barberie ...	Satisfaction	25½	7 12	38	14¼	14	8	6¾	15	...	96
E. M. Herring ...	Redsncoth ..	32	6 6	31½	14	14½	6¼	6	14¾	...	87
E. M. Herring ...	Satisfaction	34½	6 5	31¼	14	14	6	6¼	13	...	84½

Mr. J. A. Bartell is to be congratulated on winning first prize in the white-skin section for the third year in succession during the three years he has been competing. He selected an area of new land, which was first ploughed at the end of August, harrowed late September, ploughed in early October and harrowed three times in November. Planting took place on 5th December, with 3 to 6 oz. cut seed, which, with a fertiliser mixture of three parts superphosphate and one part sulphate of ammonia at 1½ cwt. per acre, was dropped in the furrow after the plough. One inter-row cultivation was given in January.

Mr. C. C. Barberie won the coloured-skin section with a crop of Satisfaction grown on land which had not previously grown potatoes; a heavy crop of trefoil no doubt added to the fertility of the land. First ploughing was given at the end of August, and the plot was spade harrowed end September, cross ploughed late October and again harrowed. Selected seed was dropped after the plough on 26th November, superphosphate being applied in the furrows at the rate of 2½ cwt. per acre. The land was harrowed after planting and again when the crop was breaking ground, and an inter-row cultivation was given in early January.

The Taralga Competition.

The twenty-three plots which were submitted for final judging in the sixth field potato competition conducted at Taralga gave the very fine average yield of 5 tons 6 cwt., despite one of the hottest and driest summers on record. The quality of the potatoes was excellent, and very little grub and scab were in evidence. The proportion of seed-sized tubers was somewhat high.

The points awarded the winners are shown in the following table :—

AWARDS (of Leading Competitors only) in the Taralga Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points Awarded.							
				Yield.	Quality.		Freedom from Disease.		Purity.	Allowance for previous cropping.	Total.
					Appearance.	Cutting.	Tops.	Tubers.			
			t. cwt.								
J. J. O'Brien ...	Factor ...	30½	8 19	44¾	13¾	13¼	7½	6½	15	...	100¾
A. J. O'Brien ...	" ...	35½	8 10	42½	13¾	13¼	7½	6¼	15	...	98¼
J. W. Walsh ...	" ...	29½	7 17	39¼	13¼	13	7¾	6¼	15	...	94½

First prize was awarded to Mr. J. J. O'Brien for a plot of Factor grown on new ground of basaltic formation, which was first ploughed on 12th August, harrowed twice, reploughed and harrowed on several occasions until planting

on 4th November. Mostly whole seed was used and superphosphate at 4 cwt. per acre was broadcast prior to planting. The plot was harrowed a week after planting and again just after the tops were breaking ground, and one cultivation was given during blossoming.

Mr. A. J. O'Brien obtained second prize, also with a crop of Factor on new ground, ploughed and planted a little later than the winning plot. Superphosphate at 3 cwt. per acre was applied at planting.

Mr. J. W. Walsh secured third prize for a plot on an area of a lighter loam than most of the potato lands of the district. Superphosphate at 2 cwt. per acre was applied prior to planting and again at 1 cwt. per acre in the furrow with the seed.

Berrima District Competition.

The high yields obtained in the second potato competition carried out by the Berrima P. and A. Society (the average was 8 tons 8½ cwt.) should do much to focus attention on the district as a potato-growing area. In addition the crop is available at a time when good prices rule, and the cutting quality of the product of the district is excellent. There are few districts in the State which offer such inducements for the profitable production of potatoes.

The points awarded the place-getters were as follows:—

AWARDS (of leading competitors only) in the Berrima District Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points Awarded.							
				Yield.	Quality.		Freedom from Disease.		Purity.	Allowance for previous cropping.	Total.
					Appearance.	Cutting.	Tops.	Tubers.			
			t. cwt.								
Conlon Bros. ...	Early Rose	37½	11 4	56	13½	14½	6¾	7	15	5	117¾
Conlon Bros. ...	Factor ...	38	10 13	53½	12½	13	6¾	6½	15	5	112
Conlon Bros. ...	„ ...	39	10 1	50½	13	13½	6¾	7	15	5	110¾

Messrs. Conlon Bros., of Exeter, won first prize with a plot of Early Rose on land which produced a potato crop last year. First ploughing was given in January, and between that time and planting on 14th October the plot was ploughed twice and harrowed three times. Extra large tubers were dipped in corrosive sublimate and cut, and the fertiliser applied at planting was a mixture of 3 cwt. superphosphate and 1 cwt. sulphate of ammonia. Half the plot received an application of sulphate of potash two weeks before planting, but this section gave a lower yield than the portion not so treated. The crop was cultivated twice in addition to two light hillings.

The same growers were also awarded second and third places.

The Flying Fox.

NOT A SERIOUS MENACE TO THE FRUIT INDUSTRY.

The flying fox is not a major pest of commercial fruit crops, but it is so spectacular in its occurrence that it is perhaps not surprising that pleas for Government action or assistance in its control should be periodically advanced. It was pointed out, however, by the Minister for Agriculture (the Hon. Hugh Main, M.L.A.), in response to a recent suggestion of this nature, that the results of a comprehensive investigation of the flying fox problem disclosed no grounds for expenditure of Government funds in such a way.

THE investigations referred to by the Minister were carried out in 1929 by Mr. F. N. Ratcliffe, B.A., a biologist appointed by joint arrangement of the Queensland and New South Wales Departments of Agriculture and the Council for Scientific and Industrial Research. The investigation revealed no economical method of dealing with the pest, but its effect was to bring the problem into exact focus, and, by assembling the essential facts with a completeness not previously attempted, thus enable the various combative practices and theories to be appraised properly.

Serious attacks on cultivated fruit were shown to be the result of a temporary disturbance in the local supply of "natural" food. In only one district in New South Wales (the area around Newcastle and Maitland), it was stated, could the flying fox be classed as a major pest of cultivated fruit. The losses were so widespread that they could only be abolished by a general eradication of the flying fox population, which was clearly out of the question. The only possibility remaining, therefore, was to conduct some method of local control in districts where losses to commercial fruitgrowers were sufficiently serious to justify the expense involved.

Observations on Suggested Control Measures.

Biological control by introduced disease did not, in Mr. Ratcliffe's opinion, present any promise of success, and the successful use of poison gases was regarded as remote, while the possibility of flame guns and explosives being used effectively and economically received only very qualified support. The value of organised shooting parties was stated to be difficult to assess. Of shooting generally it could be said that (1) it was practically useless as a method of eradicating a camp; (2) a heavy battue might cause a camp to shift temporarily, though it would probably re-form somewhere in the neighbourhood (in the case of migrating mobs it might accelerate their departure from the district); and (3) an organised campaign, pursued over a number of years, might have a very beneficial general effect if it were directed against the greyheaded fox (*Pt. poliocephalus*), the most important species from the economic point of view.

Discrimination with respect to sex was also advocated; only females carrying young (which were easily distinguishable both at rest and on the wing) should be shot. Not only would a considerable number of the next generation thus be destroyed, but the balance of the sexes would also be affected. That it did not encourage any such discrimination was a serious objection to the scalp bounty system.

With regard to shooting for the protection of the fruit crop it was recommended that, in order to effect the greatest benefit, the foxes should be shot on their first appearance in the orchard. If left alone for several nights their number would almost certainly increase, whereas if prompt action were taken it was often possible to keep an orchard free from foxes for weeks at a time.

Poisoning Gives Good Local Control.

Poisoning in orchards was already widely practised by growers who had convinced themselves of its value. There was no doubt, however, that many growers who so far had failed or refused to adopt it (either because they were ignorant of how it should be carried out, or because they considered it too dangerous) would employ this method of dealing with flying foxes if they were convinced of its practicability and safety. When proper precautions were taken the danger was almost negligible, even where pigs and fowls were allowed to roam the orchard. The following precautions should be observed: (1) The actual growing fruit should not be poisoned, unless marked in some way; (2) no fruit should be used which is liable to fall to pieces; (3) the poisoned fruit should be firmly attached to a branch, preferably high up; (4) the bait should be removed as soon as it has ceased to be attractive. The best bait, it was stated, was a ripe apple, as it merely shrivelled up and did not fall to pieces like a peach.

Scalp Bounty System Condemned.

With certain qualifications, Mr. Ratcliffe's observations generally condemn the scalp bounty system, mainly for the reasons that:—

(*a*) Such a system operates with the least efficiency when only a small percentage of the population of the animal concerned causes economic damage, as is the case with the flying fox.

(*b*) It is impracticable to discriminate, for bounty purposes, between the more serious species, from an economic standpoint, and the relatively harmless species.

(*c*) The numbers of flying foxes occurring in Australia are so vast that it would not be practicable to pay a bounty which would offer adequate inducement for the destruction of the foxes and at the same time be of compensating economic value.

Copies of the Full Report Available.

A limited number of copies of Mr. Ratcliffe's full report (Bulletin No. 53, issued by the Council for Scientific and Industrial Research) are available for distribution from this Department. Address your request to the Under Secretary, Box 36A, G.P.O., Sydney.

Pumpkins and Squashes.

Classification and Description of Varieties.

W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeder.

In a previous article by the author (see this *Gazette*, December, 1929) the locally-known varieties of pumpkins, squashes, &c., were classified according to species, viz., *Cucurbita maxima*, *C. pepo*, and *C. moschata*, the points of difference between these species being indicated. *C. maxima* is easily separated from the other species by its general type of seed, its large, unlobed, kidney-shaped leaves, and the smooth, cylindrical and soft fruit stalk.

It was mentioned that in the United States of America there is a desire to keep to the term "squashes" for all varieties belonging to *C. maxima*, and to refer to all varieties belonging to *C. pepo* as "pumpkins." This cannot be done in Australia, and a strong plea is made for the opposite nomenclature, since the hubbard and banana groups are much more akin to our common pumpkins, with their firmer flesh and keeping qualities, than they are to squashes and marrows with their softer, more watery flesh.

Thus the species of *Cucurbita* may be better recognised and described as follows:—

C. maxima (Pumpkins).—Mostly hard-shelled, long-growing types, which keep well and can be stored.

C. pepo (Squashes and Marrows).—Mostly early bush or running types, which do not keep well, and which are to be used before the shell hardens.

C. moschata (Grammas or Rios).—Late-maturing types, used for pies or stock, and which keep and store well.

Part I.—Pumpkins.

In this section of the article the varieties of the species *C. maxima* Duch (pumpkins) are described; subsequent sections will deal with squashes, marrows and grammas or rios (*C. pepo* and *C. moschata*).

Plants strongly running; stems cylindrical but not grooved; rough hairy, rather than spiny; leaf blades kidney-shaped but not lobed; leaf spots absent. Staminate and pistillate flower stalks cylindrical; unopened buds truncate; corolla tube nearly cylindrical, lobes rounded and reflexed; sepals linear; staminate calyx cup-shaped, pistillate calyx saucer-shaped to cup-shaped. Stamens short and rounded. Fruit stalk cylindrical, not enlarged at attachment to fruit, soft at maturity. In elongated fruits the style is persistent. Seeds white, brown or bronze; white seeds have margin identical in colour and texture with body of the seed; in brown or bronze seeds the margin is lighter in colour than body of seed. Seed scar is slanting.

Pumpkins consist of the following groups:—

(1) Table or vegetable pumpkins; (2) field or cattle pumpkins; (3) hubbard pumpkins; (4) banana or alligator pumpkins.

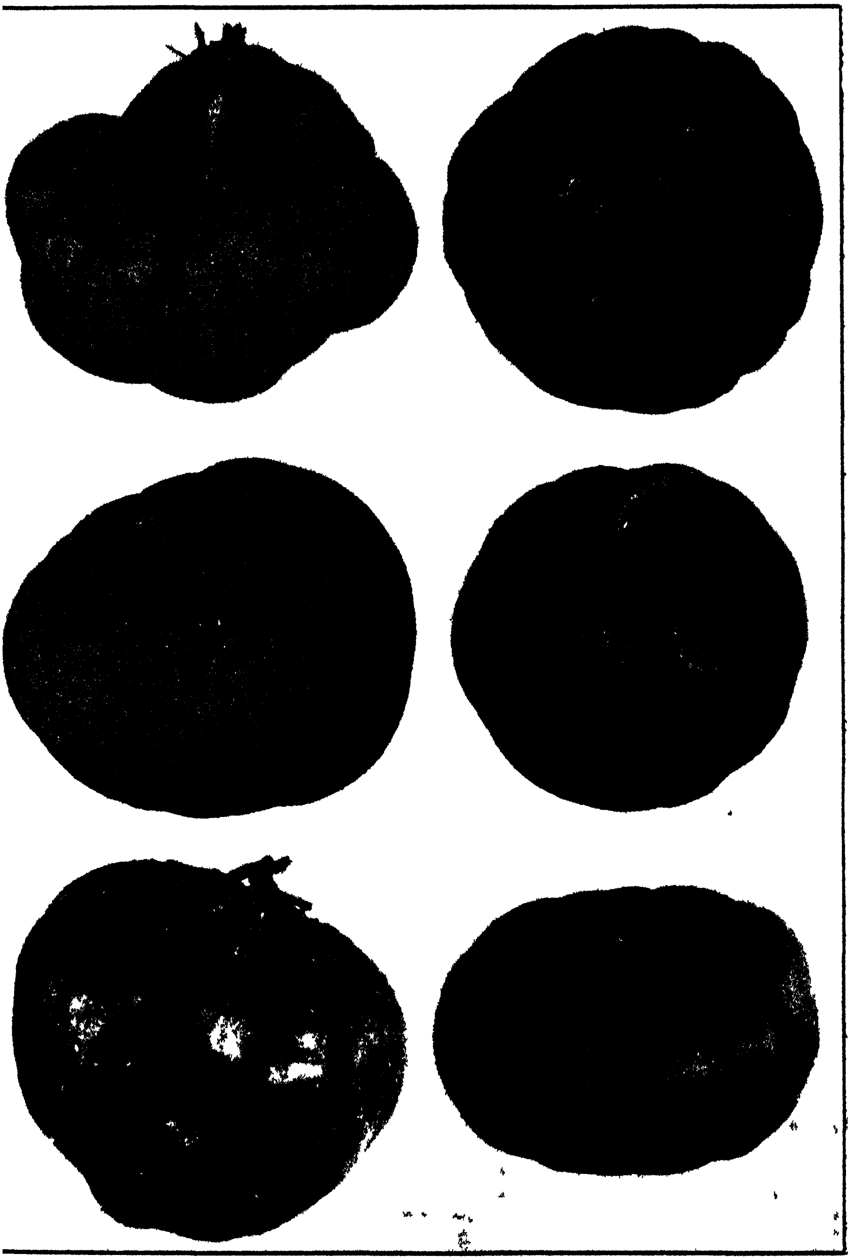


Table and Cattle Pumpkins.

Top left: Triangle.
Centre left: Mammoth Yellow.
Bottom left Mammoth Chili.

Top right · Queensland Blue.
Centre right: Mammoth Bronze.
Bottom right. Large Button.

The Table or Vegetable Pumpkins.

The varieties in this group are hard-skinned, mostly slaty green in colour, and weigh up to about 15 lb. They are not nearly as large as field or cattle pumpkins, are more dense in texture and have only a very small seed cavity. The flesh is pale yellow to almost orange red. The deeper-coloured pumpkins, as a rule, have better texture and cooking qualities than the paler sorts. Varieties belonging to this group are :—Crown, Triangle (Triamble), Ironbark, Queensland Blue or Beaudesert, Ideal.

Crown.—Medium-sized pumpkin, more or less ribbed, slaty green in color. size 9 inches by 6 inches, average weight 12 lb. Flesh yellow and fine grained. Blossom end is raised in rough shape of a crown. This variety shows a diversity of type both in shape and quality; amongst these are many excellent table pumpkins.

Triangle (Triamble).—A very popular type of pumpkin, roughly triangular in shape. The fruit is trilocular, each loculus developing separately, leaving large furrows between them. The average weight is 10 to 15 lb.; the skin is smooth and moderately hard, French grey in colour, and the flesh is orange-red in colour and fine grained. An excellent table variety.

Ironbark.—A variety with a dark slaty green colour of skin. The shell is extremely hard and most difficult to cut with an ordinary table knife. The shape is round, not deeply ribbed, and the weight is 10 to 12 lb. The flesh is usually very deep in colour and fine grained, with good cooking qualities. Though a very common variety at one time, it has largely gone out of cultivation.

Queensland Blue.—Medium-sized pumpkin, heavily ribbed; bronze green in colour; size, 8 inches by 5 inches; average weight, 9 to 12 lb. The seed cavity is very small, and the flesh yellow and fine grained. It is an excellent table variety.

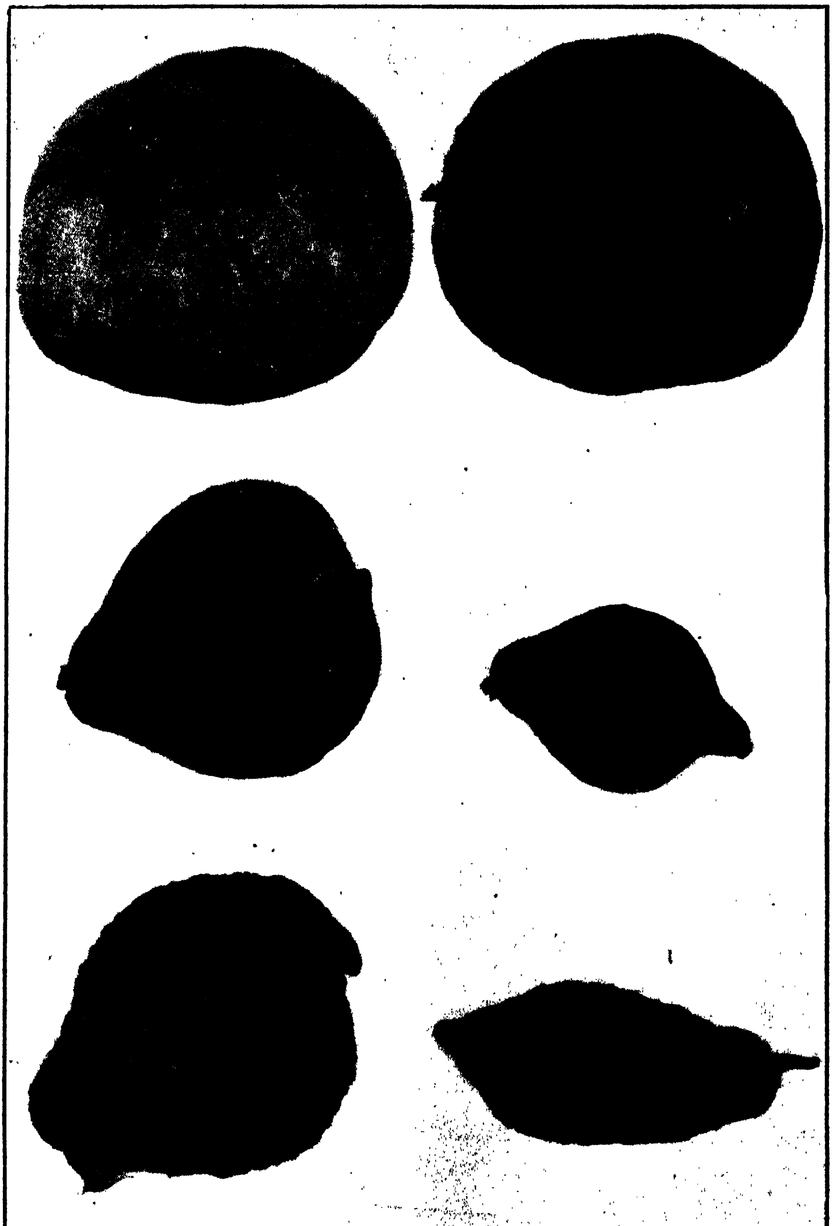
Ideal.—A medium to small pumpkin, ribbed; slaty green in colour; size, 8 inches by 5 inches; average weight, 6 to 10 lb. The flesh is a deep yellow colour, and the texture fine grained. An excellent quality table pumpkin.

Field or Cattle Pumpkins.

These are large, hollow, soft-shelled pumpkins, weighing from 20 to 40 lb. and over. The colour is generally pink or slaty green, and the shape mostly oblong or round. The seed is large and pure white, but is not very thick. The varieties in this group are :—Mammoth Bronze, Mammoth Chili, Globe Mammoth, Large Button, Mammoth Yellow or Large Yellow, Mammoth Cattle, Small Button, Turks's Cap, Potiron.

Mammoth or *Large Yellow.*—A large spherical pumpkin, with a very large seed cavity; weight, 25 lb. The skin is pinkish yellow and netted, and the flesh yellow and very coarse grained; shell soft. A true cattle pumpkin and suitable for stock feed.

Globe Mammoth and *Hundredweight* are synonyms of Mammoth.



Cattle, Hubbard and Banana Pumpkins.

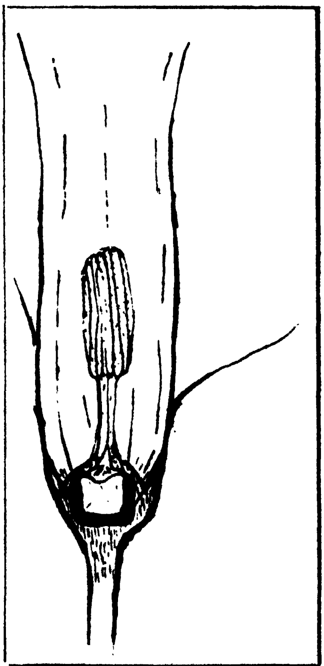
Top left: Small Button.
Centre left: Green Hubbard.
Bottom left: Warted Hubbard.

Top right: **Potiron.**
Centre right: **Golden Hubbard.**
Bottom right: **Alligator.**

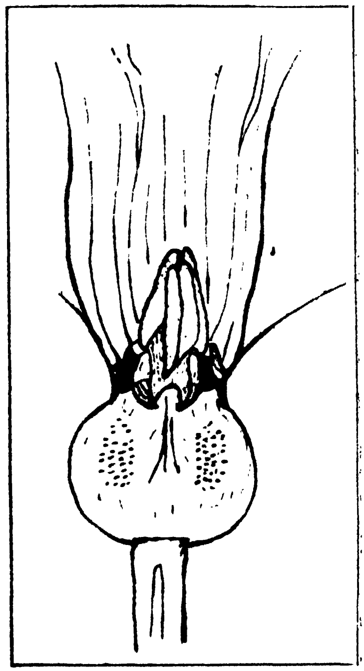
Mammoth Cattle.—A large, hollow pumpkin, slaty green in colour, long and oblong in shape; weight, 30 lb. The flesh is very pale and coarse, and the skin smooth, but the surface shows somewhat longitudinal grooves. As the name implies, this is a typical cattle pumpkin.

Mammoth Bronze.—A cattle pumpkin, pink in colour, large globose in shape, with a very large seed cavity; weight 20 lb.; size 9 inches by 9 inches; flesh pale and coarse.

Mammoth Chili.—A large hollow pumpkin, reddish orange in colour; size, 10 inches by 10 inches; weight, 20 lb.; teated at blossom end owing to persistence of style. The flesh is pale and coarse. A typical cattle pumpkin.



Male Flower of the Pumpkin.



Female Flower of Table Pumpkin (variety Queensland Blue).

Large Button.—A medium-sized pumpkin, more or less ribbed, slaty green in colour; size, 10 inches by 5 inches; weight, 10 to 15 lb. The flesh is yellow and somewhat coarse grained; blossom end flattened, with large corolla ring. A mixed variety of fine and coarse types. Some of the smaller sorts make good table pumpkins, but the larger types are too coarse and are classed as cattle pumpkins.

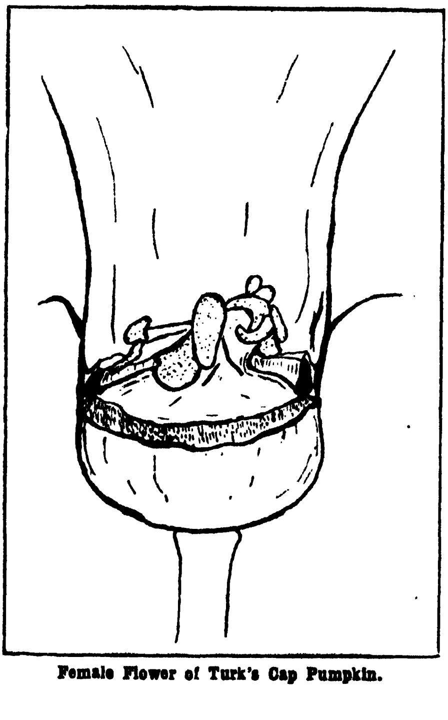
Small Button.—A globe-shaped pumpkin, 10 inches by 10 inches in size; weight, 30 lb.; slaty green in colour. The flesh is pale and coarse. Not as hollow as some of the other cattle varieties.

Turk's Cap.—This variety is somewhat rounded in shape, but the blossom end is enlarged; size, 13 inches by 6 inches; weight, 10 to 20 lb.; the skin is generally smooth, and from greenish red to bright red in colour; flesh, yellow and coarse. Grown mostly for exhibition purposes and for stock feed.

Potiron.—The fruit of this variety is large and round, orange red in colour with smooth skin; average weight, 30 lb. The seed cavity is very large, and the flesh coarse and pale. Very similar to Mammoth Chili.

Hubbard Pumpkins.

The varieties in this well-known group have a very characteristic shape. The skin is soft to medium hard, and varies in colour from green and slaty green to yellow. The Hubbard varieties range in size from 5 to 15 lb., while the texture and quality in most cases are very good. As a group they are early maturing, and are generally the first pumpkins of the season. The following varieties are included in the group:—Improved, Green, Blue, Warted, Golden, Boston, Vermont, Kitchenette.



Female Flower of Turk's Cap Pumpkin.

Improved Hubbard.—The characteristic shape is nearly spherical, tapering to a neck at the stem end, and to a curved, pointed projection at the blossom end. This projection ends in the style, which is persistent at maturity. The surface is smooth or rough, and the colour variable; weight, from 5 to 15 lb. The flesh is generally of deep yellow or orange red colour, and fine grained. This variety has excellent cooking qualities and good keeping qualities.

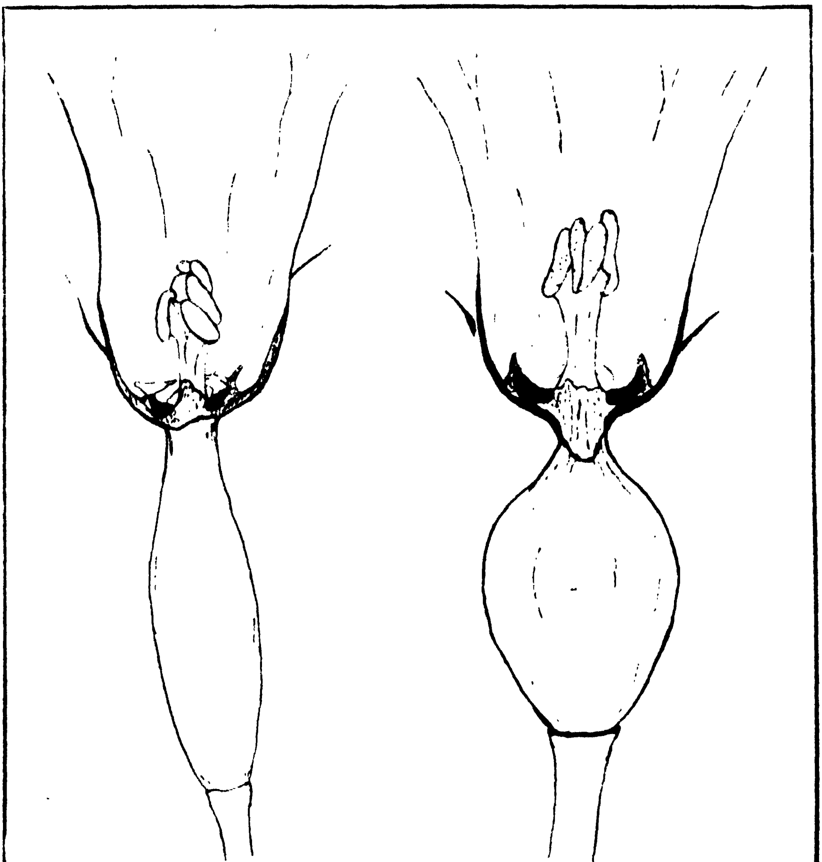
Green Hubbard.—Dark green in colour, slight warting of the surface; weight, 4 to 6 lb.; flesh deep yellow and fine grained. Good cooking qualities.

Golden Hubbard.—A small hubbard, about 3 to 5 lb. in weight.; golden colour, tinged with red. Good cooking qualities.

Blue Hubbard.—Not a typical hubbard; has slaty green skin, slightly warted; weight, 12 lb. The flesh is deep orange in colour, and fine grained; shell moderately hard and thick. This variety cooks well, and is of good flavour and quality.

Warted Hubbard.—A large green hubbard with skin very much warted; surface grooved; weight, 5 to 10 lb. Flesh yellow in colour but coarse. Not as good in quality as other hubbards.

Boston Hubbard.—A variety of hubbard; orange red in colour; weight, 12 lb.; skin smooth and soft; flesh yellow, but inclined to be coarse. This variety is not as good in quality as other hubbards.



Female Flower of Banana Pumpkin (variety Plymouth Rock). **Female Flower of Hubbard Pumpkin (variety Green Hubbard).**

Vermont Hubbard.—A green hubbard of excellent flavour and quality; weight, 8 lb.; skin thick and soft; flesh deep yellow and fine grained. A very uniform variety recently introduced from U.S.A.

Kitchenette Hubbard.—An improved hubbard of American origin; size, 9 inches by 6 inches; weight, 5 lb. Skin glossy and dark green; flesh of good colour and fine grained. An excellent household variety owing to its very suitable size.

Banana Pumpkins.

These are elongated types with a rather soft shell and a large seed cavity and usually slaty green in colour. Under good conditions they may reach 20 lb. in weight. Though somewhat soft in texture, the quality is excellent. The varieties are :—Banana, Alligator, Plymouth Rock.

Banana.—An elongate type of fruit, cylindrical, yet pointed at both ends; size, 15 inches by 5 inches; weight, 10 lb. Skin smooth, slaty grey with long, light-coloured streaks; surface smooth, shell soft. The flesh is yellow and fine grained, and the flavour is excellent, but the fruit is very soft and moist on cooking. This variety gives its name to the Banana group.

Alligator.—An elongate type of pumpkin, cylindrical, yet somewhat pointed at both ends; size, 15 inches by 7 inches; weight, 10 to 15 lb. Skin slaty green, surface somewhat knotted or warted with longitudinal grooves. Shell medium hard; flesh deep yellow and fine grained. Has excellent flavour but moist cooker. This variety is a recent introduction from U.S.A. Closely resembles Blue Hubbard.

Plymouth Rock.—The fruit of this variety is cylindrical and elongate, tapering at both ends; size, 18 inches by 6 inches; weight, 15 lb. The skin is smooth and thin, soft, slaty grey in colour with paler broken stripes; flesh deep yellow colour, fine grained. Quality very good and is very sweet to taste.

[Subsequent sections of this article will deal with squashes and marrows and grammas (or rios).]

(*To be continued.*)

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Gunnedah	Sept.	2, 3
Gosford (H. G. Baker)	„	2, 3
Forbes (E. A. Austen)	„	6, 7
Murrumburrah (W. Worner) ...	„	6, 7
Finley	„	7
West Wyalong (T. A. Smith) ...	„	7, 8
Boorowa (S. G. Hughston) ...	„	8, 9
Galston	„	9, 10
Cowra (E. P Todhunter)	„	13, 14
Barmedman...	„	14
Singleton	„	14, 16
Canowindra (W E. Frost)... ...	„	20, 21
Temora (J. M. McInnes)	„	20, 21, 22
Lockhart	„	21
Quandialla	„	28
Berrigan (R. Wardrop)	„	28
Barellan	Sept.	28
Hillston	„	28, 29
Hay	„	28, 29
Hall—Fed. Cap. Territory (C. R. E. Southwell)	„	30, Oct. 1
Narrandera (J. D. Newth)... ...	Oct.	4, 5
Bribbaree (K. McCallum)	„	5
Walbundrie (H. G. Collins) ...	„	5
Leeton (E. C. Tweedie)	„	11, 12
Ardlethan (E. C. Knight)	„	28
Ariah Park (M. Collings)	„	12
Corowa (H. G. Norton)	„	13, 14
Griffith (M. E. Sellin)	„	18, 19
Deniliquin (P. Fagan)	„	19
Cootamundra (G. B. Black) ...	„	25, 26

1933.

Dungog (W. H. Green)	Mar.	30, 31, Apl. 1
Casino (E. J. Pollock)	May	16 to 18

Dairying Notes.

How the College Jerseys are Fed.

At the Tenth Annual State Conference of the Agricultural Bureau, reference to which is made elsewhere in this issue, Mr. A. C. Small, Special Dairy Instructor at Hawkesbury Agricultural College, traced the development of the College herd from the time (fifteen years back) when the average production was only 170 lb. butter per cow, until the present day, when the herd average was 500 lb. per cow.

Readers will be interested in the ration fed to these heavy producers, which consists of 20 lb. silage, 8 to 10 lb. lucerne hay and 3 lb. concentrates. The concentrate consists of bran 100 lb., linseed meal 50 lb. and bone meal 3 lb. A second concentrate, consisting of 150 lb. finely crushed maize meal, 100 lb. bran, 50 lb. linseed meal and 50 lb. crushed oats, is sometimes used. from 2.2 to 2.5 lb. of this being fed to each cow.

40,000 Tons of Butter from Inland Factories.

"The establishment of dairying throughout the western slopes has received special attention during the last two years," said Mr. L. T. MacInnes, Director of Dairying, in the course of an address at the Agricultural Bureau Conference. "The aim is not to supplant wool and wheat, but to expand the present system of mixed farming to include dairying," continued Mr. MacInnes, "and the monthly cheques from sales of milk products will be the sheet-anchor by which the more risky and annual returns from wool and wheat can be averaged to sustain the farmer's family and operations.

"Owing to the saturation of the local market, each ton increase means an equivalent increase in overseas export. Increased production will mean all-the-year-round exportation in large quantities, closing the gap between overseas and local prices, and, as the inland production period covers the winter and early spring months, no shortage of supplies on the home market, thus bridging the difference between its summer and winter prices.

"Indications are that there will be a great and continuous expansion in production and in volume of export. Australia's production should reach to 300,000 tons of butter in the near future; that of New South Wales 100,000 tons, of which inland factories will furnish 40,000 tons. The exports should then be 200,000 tons for the Commonwealth and 50,000 tons for New South Wales."

Better Feeding Methods Becoming More General.

Frequent reference has been made in the recent reports of district dairy instructors to the improved methods of feeding stock that are becoming everywhere more general among dairy farmers. Instead of the wasteful method—in some instance still far too common—of cutting the greenstuff and throwing it out into the paddocks, many farmers now chaff the material and stall-feed the cows.

Throwing the material out into the paddocks is not only wasteful from the point of view of utilising the full nutritive value of the fodders, but is objectionable from other standpoints. Dairymen have no doubt noticed that by adopting this method of feeding their cows the herd is continually being disturbed by the more robust animals, which endeavour to obtain more than their share of the feed, with the result that the younger and weaker ones are deprived of their proper nourishment.

The proper manner, then, in which to utilise farm crops is to combine them in a ration in such a way that the requirements of the animal are fully provided for, bearing in mind, of course, that the feed requirements of a cow varies with different animals and according to her weight and the amount of milk she is producing.

A Well-balanced Ration.

A well-balanced ration for a dairy cow is one wherein the above factors are taken into consideration, and the proportion of protein to carbohydrates is about 1 to 5 or 1 to 6, *i.e.*, 1 lb. of digestible nitrogenous matter to 5 or 6 lb. of carbohydrates. The amount of dry roughage required for a cow in milk may be stated as approximately 2 lb. to every 100 lb. of live weight, or 1 lb. of roughage and 3 lb. of silage to the same live weight. A ration for maintenance purposes only does not need to be as rich in protein as in the case of a cow producing, say, 30 lb. of milk daily; a ratio of 1 to 12 or 1 to 13 would be the most economical for simply maintaining an animal in good health. On the other hand, young growing animals require a much narrower ration than that of a cow in milk, in order to provide for flesh, muscle, bones, tissue, etc. The nutritive ratio in this case could be as low as 1 to 3. For maintenance purposes only, a dairy cow of 1,000 lb. live weight requires approximately .7 lb. of digestible crude protein, 7 lb. of digestible carbohydrates, and .1 lb. of fat. A cow would require approximately 50 lb. of silage or 50 lb. of paspalum daily to supply this amount of digestible nutrients.

Tasmania Accepts our Tubercle-free Cattle Without Further Test.

For some years the Stock Branch of the Department of Agriculture has undertaken the testing of certain herds for tuberculosis and has placed those considered free on a tubercle-free accredited herd list, which is published each month in this *Gazette*.

The Tasmanian Government has now decided that cattle from accredited tubercle-free herds in New South Wales may enter that State without further test.

Grass Seed Abscesses Often Mistaken for Tuberculosis.

In many districts of the State cases frequently occur of what are known as grass seed abscesses. These often simulate tuberculosis and necessitate

inspection by a veterinarian or inspector of stock to determine which condition is present. The photographs reproduced hereunder were supplied by Mr. E. Reuss, Inspector of Stock, Mudgee, and illustrate the condition fairly clearly.

Fig. 1 shows a case of grass seed abscess in the region of the lower jaw. Material submitted in this case to the Glenfield Veterinary Research Station failed to reveal the presence of tubercle bacilli.

Fig. 2 shows a case of grass seed abscess that has broken and discharged. Post mortem examination of this animal subsequently showed that it was free from tuberculosis.

Fig. 3 shows a grass seed abscess on a steer.

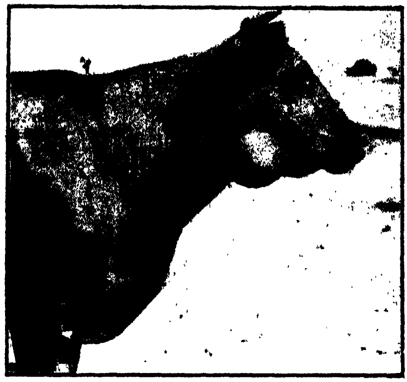


Fig. 1.

Fig. 2.

Fig. 3.

The Dairy Farm Championship.

THE attention of dairy farmers who intend to enter their farms in the dairy farm championship is directed to the fact that factory managers will accept their entries up till 30th September. This will enable judging in the local competitions to be commenced by the district dairy instructors early in October. The championship, for which the winners of the local competitions will be eligible to compete, will be judged according to the following scale of points.

Scale of Points for Judging Dairy Farm Championship.

	Maximum Points.
Section 1.—Dairy Herd (700 points).	
Breeding—	
(*a*) Use of purebred registered sire	200
(*b*) Use of registered sire with dam's production records	50
(*c*) Type and Conformation	150
Quality of Stck Bred on Farm...	100
Apparent freedom from disease (based on routine dairy stock inspection)...	50
Herd Recording and apparent results	125
Records kept of breeding and production	25
Section 2.—Layout of Farm And Economic Working—(500 points).	
Layout of paddocks, condition of fences and gates, water service...	125
Dairy bails, yards, buildings, farm machinery and plant (includes care and condition)	125
Drainage, sanitation, garden, general conveniences for home comfort	100
Cream quality or milk quality...	100
Shade and shelter trees...	50
Section 3.—Pastures, Conservation of Fodder, etc.—(500 points).	
Pastures and their improvement	300
Hay, grain, crop silage or grass silage...	150
Green crops	50
Section 4.—Pigs (200 points).	
Breeding and commercial type...	80
Location, layout, shade and shelter, condition of pens and runs	45
Methods of feeding, suitability of ration	45
Quality and general health of stock kept and bred by owner	30
Section 5.—Sidelines (100 points).	
Poultry (quality of stock and housing)	30
Bees	10
Vegetables (variety and lay-out)	30
Orchard (variety, care of trees, and freedom from disease and pests)	30
Grand Total	2,000

Butter Manufacture.

In the past it has been the practice to allow a modification of the requirements of the Dairy Industry Act in order to meet the situation where dairy farmers are producing cream in excess of their own requirements but are not in a position to deliver to a dairy produce factory. An endeavour has been made, however, to take advantage of this arrangement in order to enable dairy factories to be operated, irrespective of the type of building employed and the class of plant installed. The Minister for Agriculture states that representations have been made to him, showing clearly that any extension in this direction would seriously threaten the existence of the dairying industry, and certain resolutions bearing on the matter were also carried at a recent conference at which all sections of the industry in question were represented.

Under the circumstances, and after giving the whole matter very careful consideration, the Minister has decided that the sub-classification of "milk products dairy" which has been adopted in the past is to be discontinued, and the Act will in future be administered strictly in accordance with the intention of its provisions. It is pointed out, however, that this decision will not in any way affect farm premises used for the purpose of treating only the milk or cream of a farmer's own herd.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
P. Ubrihien, Corridgeree, Bega	133	2 Sept., 1932
Department of Education, Gosford Farm Homes	38	2 ,, 1932
James McCormack, Tumut	98	9 ,, 1932
St. John's College, Woodlawn, Lismore	40	11 ,, 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	13 ,, 1932
A. L. Logue, Thornboro, Muswellbrook	41	14 ,, 1932
E. E. Winder, Wybong Road, Muswellbrook	46	14 ,, 1932
Gladesville Mental Hospital	40	14 ,, 1932
Coast Hospital, Little Bay	66	15 ,, 1932
Lunacy Department, Parramatta Mental Hospital	33	16 ,, 1932
Wagga Experiment Farm (Jerseys)	64	16 ,, 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 ,, 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1932
St. Patrick's College, Goulburn	7	21 ,, 1932
A. H. Webb, Quarry Road, Ryde	4	24 ,, 1932
E. E. McMullen, Springnook, Holbrook	32	25 ,, 1932
W. R. Boughton, Holbrook	22	27 ,, 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	31	28 ,, 1932
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 ,, 1932
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 Nov., 1932
Wolaroi College, Orange	11	19 ,, 1932
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1932
Berry Experiment Farm	129	26 ,, 1932
J. B. Burtenshaw, "Sunnyside," Inverell	36	27 ,, 1932
Parker Bros., Hampton Court Dairy, Inverell	74	27 ,, 1932
W. K. Frizell, Rosenstein Dairy, Inverell	44	28 ,, 1932
J. L. W. Barton, Wallerawang	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood	8	3 ,, 1932
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 ,, 1932
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	9	3 ,, 1932
A. N. de Fraine, Happy Valley Dairy, Inverell	9	6 ,, 1932
W. Pigg, Redlands Dairy, Inverell	33	6 ,, 1932
Lunacy Department, Morisset Mental Hospital	27	7 ,, 1932
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1932
Newington State Hospital and Home	100	17 ,, 1932
W. T. Herbert, Racecourse Farm, Bega	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega	78	8 ,, 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 ,, 1933
H. A. Corderoy, Wynna Park, Barrington, via Gloucester (Guernseys)	80	22 ,, 1933
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 ,, 1933
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
New England Girls' Grammar School, Armidale	29	3 ,, 1933
Lidcombe State Hospital and Home	149	3 ,, 1933
G. L. Genge, "Easton," Armidale	33	4 ,, 1933
A. B. Finney, Fox Ground, Gerringong	29	11 ,, 1933
George Rose, Aylmerton	3	23 ,, 1933
Riverina Welfare Farm, Yanco	89	24 ,, 1933
Department of Education, Yanco Agricultural High School	39	24 ,, 1933
Mittagong Farm Homes	36	24 ,, 1933
Liverpool State Hospital, Liverpool	72	3 Mar., 1933
Miss Brennan, Arankamp, Bowral	17	8 ,, 1933
G. W. Young, "Boorganna," via Wingham	41	10 ,, 1933
Lunacy Department, Kenmore Mental Hospital	80	27 ,, 1933
P. M. Burtenshaw, Killean, Inverell	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra	20	6 ,, 1933
A. D. Frater, "Fairview Dairy," Inverell	51	6 ,, 1933
A. H. Pye, Loch Levan, Inverell	47	7 ,, 1933
W. Newcomb, "Minnamurra," Inverell	72	7 ,, 1933
Rydalmere Mental Hospital	77	7 ,, 1933
St. Joseph's Girls Orphanage, Kenmore	11	13 ,, 1933
St. Joseph's Convent, Reynold-street, Goulburn	8	14 ,, 1933
St. Michael's Novitiate, Goulburn	4	14 ,, 1933
Marion Hill Convent of Mercy, Goulburn	47	15 ,, 1933
G. A. Parish, Jerseyland, Berry	93	21 ,, 1933
Australian Missionary College, Cooranbong	72	5 May, 1933

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
W. M. McLean, Five Islands Road, Unanderra...	76	6 May, 1933
Koyong School, Moss Vale	8	11 ,, 1933
James Wilkins, "Jerseyville," Sandy Creek Road, Muswellbrook ...	40	12 ,, 1933
Tudor House School, Moss Vale ...	14	13 ,, 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	226	2 ,, 1933
W. Hammond, Bellingen ...	77	16 ,, 1933
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1933
E. C. Nicholson, Jillamatong, Corowa ...	180	23 ,, 1933
Grafton Experiment Farm	271	14 July 1933
William Thompson Masonic School, Baulkham Hills	87	20 ,, 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1933
G. V. Ralston, "Porphry," Seaham	98	21 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	80	25 Aug., 1933
Sacred Heart Convent, Bowral ...	10	26 ,, 1933
Hawkesbury Agricultural College (Jerseys) ...	118	3 April, 1934
Cowra Experiment Farm ...	26	27 ,, 1934

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.

—MAX HENRY, Chief Veterinary Surgeon.

TO ASCERTAIN THE CAPACITY OF A SHEEP DIPPING BATH.

A CONVENIENT way to ascertain the capacity of a sheep dipping bath is to measure water into it from a tank of known capacity. First run into the bath, say, 3 feet of water and keep a record of the number of gallons required to do this by marking same permanently on the side of the bath. Now continue to add water in 100-gallon quantities and mark each of these 100-gallon levels on the side of the bath up to 6 inches from the top. A rod may be marked in a similar way, in which case it is advisable to have several rods in case one gets lost.

INFECTIOUS DISEASES REPORTED IN JULY.

THE following outbreaks of the more important infectious diseases were reported during the month of July, 1932:—

Anthrax	Nil.
Blackleg	7
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	2
Swine fever	Nil.
Contagious pneumonia	2
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Tobacco Notes for September.

C. J. TREGENNA, Tobacco Expert.

Light Sandy Soil Essential.

LAST year the Department of Agriculture sounded a special note of warning to prospective tobacco growers against attempting to produce this crop under conditions that were not favourable to the production of leaf for which there is a stable demand by manufacturers, namely, that of a bright colour, good texture and having a mild pleasant aroma on combustion. At the time it was stressed that, in order to grow high grade leaf of this quality, it must be produced on light sandy soil in districts having a good summer rainfall. Notwithstanding the publicity given to the matter, the Department continues to receive inquiries from persons in various districts throughout the State who contemplate taking up tobacco growing on land that is manifestly unsuitable for the production of bright leaf.

The Minister for Agriculture (the Hon. Hugh Main, M.L.A.), therefore, deems it advisable to draw attention again to the fact that if this State is to compete successfully with imported leaf, as well as with that which is now being produced in Queensland, it is essential that the tobacco should be grown on light sandy soils in districts which have a satisfactory rainfall during the growing period. Irrigation does not altogether displace rainfall, and although overhead irrigation would be helpful, the right conditions of humidity must be present if good quality leaf is to be produced. Hot, dry winds are most detrimental to the final quality of the leaf, and regular rainfall is most desirable.

It is quite evident that the demand is for a type of leaf which can be produced only under the conditions mentioned, and while the Department is anxious to assist the growers in the older tobacco areas by carrying out experiments with a view of finding some means of improving the quality of the leaf produced on the heavier soils, it must be admitted that, on present day knowledge, it is advisable to utilise only the lighter soils in order to secure the necessary quality.

Growers should give particular heed to this advice, as otherwise it is inevitable that many of them will be left with a considerable quantity of leaf on hand for which there is very little demand.

Some Topical Cultural Notes.

In last month's issue the preparation of seed-beds and frames and the sowing of the seed were dealt with. The next matter to claim the tobacco

grower's attention is the proper care of the young plants in the seed-bed or frame, particularly with the idea of controlling blue mould disease.

The temperature in a heated frame should not be allowed to fall below 45 deg. Fahr., and only sufficient water should be given to maintain vigorous, hardy growth. The water should have the chill taken off it before it is applied. To secure the best results the plants must be given all the sunlight possible by removing the sashes during the day, care being taken to replace them at night, or during cold winds or rain. By increasing the amount of direct sunlight given, the plants can be hardened-off for transplanting.

Where permanent frames are not in use it is necessary to cover the beds for protection against cold, the sun, and insects. A simple plan is as follows:—At the centre of each end of a bed drive one small post, leaving it about 12 inches above the ground level, and strain a length of No. 10 wire from one to the other; place a few small posts along the bed to take up any sag. Attach to the wire white hessian or cheese-cloth. This may be stitched to the wire tightly with binder twine or string with the aid of a packing needle. The covering should be stretched tight and fastened to the side by hooking over nails. The bed should be covered every evening and not uncovered until sunrise.

Keep the beds moist, but not wet, until the plants are well established. It is important that the beds should never be allowed to become dry on the surface while the seed is germinating. After the plants have reached some size it is better to water thoroughly occasionally—not too often, but *thoroughly* when it is done. This will reduce the danger from mould. No fixed rule can be given for watering, but do not water beds which are uncovered while the sun is at all strong.

Plants which come up too thickly in the seed-beds are apt to be weedy and spindly specimens, and should be thinned out so that each occupies an area of about a square inch. If plants are not coming on as fast as it is wished after they are up, a sugar bag may be filled with horse manure, the neck tied, and the bag soaked in a cask of 40 gallons of water for a day. The liquid can then be freely used twice a week on the beds with a can that has a fine rose.

In about one month the beds will be ready to be uncovered and the seedlings to be hardened off before transplanting. This should be done gradually. For the first few days, if the weather is very hot, cover up in the middle of the day until the plants can stand the direct heat of the sun.

If there is danger of the seedlings being attacked by stem grubs or tobacco leaf miners they should be sprayed with arsenate of lead.

Control Measures for Blue Mould.

Blue mould especially attacks young plants in the seed-bed, and is most prevalent in seasons of excessive rainfall. If conditions favour its spread, the whole seed-bed may be damaged in the course of a few days.

Control methods must aim at preventing conditions favourable to the development of the disease, and may be summarised as follows:—

1. Prepare a number of seed-beds, suitably manured, so that the young plants may quickly become established.
2. Sow these beds at intervals of two or three weeks. Use seed from healthy crops.
3. Do not over-water the young plants; excessive moisture favours the disease.
4. Conserve heat, as a temperature below 45 deg. Fahr. favours the disease. Experiments conducted by the Department during the last eleven years indicate that if the temperature of the seedlings is not allowed to fall below 45 deg. Fahr., and the surrounding atmosphere is not allowed to become humid, blue mould does not make its appearance.
5. Allow the young plants plenty of air and sunlight.
6. Transplant at the earliest opportunity.
7. If the disease makes its appearance in any one of the beds, pull up and burn the infected plants immediately, and spray the remainder with Bordeaux mixture (2-2-50).

Big Yields in the 1931–32 Sweet Potato Trials.

Trials to ascertain the best varieties of sweet potatoes for different districts were carried out last season in conjunction with Messrs. Crabtree and Exley, Dee Why; S. Redgrove, "Sandhills," Branxton; C. Devlin, Agnes Banks, *via* Richmond; and W. Smith, Swanreach, *via* Hinton. Apart from demonstrating what is possible in the way of yields (even under the adverse seasonal conditions that were experienced last year), provided suitable varieties are grown and proper cultural methods employed, last year's trials went far to disprove the much-held belief that rich alluvial loams are unsuitable for sweet potatoes in that they encourage excessive top growth at the expense of tubers. Last season's results (given hereunder) are interesting on this point, as the soils on the plots at both Richmond and Hinton are rich alluvial loams, while those at Branxton and Dee Why are very light sandy soils.

Yields in the Sweet Potato Trials, 1931–32.

	C. Devlin, Richmond.			W. Smith, Hinton.			S. Redgrove, Branxton.			Messrs Crabtree and Exley, Dee Why.		
	tons	cwt.	qr.	tons	cwt.	qr.	tons	cwt.	qr.	tons	cwt.	qr.
Southern Queen		......		19	12	0	6	11	1		......	
Yellow Strassburg		......		18	12	0	11	16	1	10	9	1
Nancy Hall	11	12	0	13	18	2	17	1	1	9	6	3
H.A.C. Pink	12	12	0	13	18	2	11	16	2		......	
Pierson	10	15	0	10	12	2		......		9	19	1
Porto Rico	9	18	0		......		13	2	2		......	
Vineless	4	1	0	5	9	2		......			......	
Brooks' Seedling		......		12	5	0	11	3	0	6	4	2
Brooks' Seedling No. 3 ...		......			......			......		9	19	1

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Funk's Yellow Dent ... Mr. J. A. L. Thompson, Deepwater, South Gundagai.
Large Goldmine ... ... Messrs. P. Short and Sons, "Moore Park," Armidale.

Sorghum—

White African ... ... Manager, Experiment Farm, Grafton.
Manager, Wollongbar Experiment Farm, Lismore.

Tomatoes—

Bonny Best ... ... Manager, Experiment Farm, Bathurst.
Improved Sunnybrook Earliana ... ... Mr. Albert Sorby, Macquarie Fields.
Marglobe ... ... Mr. S. A. Spicer, "Billabong," Lewis Ponds.
Manager, Experiment Farm, Bathurst.

Asparagus—

Connover's Colossal ... H. Eastwood, Tascott, *via* Woy Woy.
Lady Washington ... Manager, Experiment Farm, Bathurst.

Banana Squash—

F. J. Offner, "Mount Olive," Dubbo.

Water-melon—

Angelino ... ... C. J. Rowcliff, Old Dubbo road, Dubbo.
Grey Monarch ... ... A. McKim, Bolwarra.
T. J. Offner, "Mount Olive," Dubbo.

Cucumbers—

Early Fortune ... ... Mr. W. Parry, Terrigal.
Mr. E. Money, Terrigal.

Grasses—

Perennial Rye Grass ... Mr. C. Watson, Pyree, *via* Nowra.
Sudan Grass ... ... Messrs. F. and H. Owen, "Applegrove," Duri.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Willson Early Plum.

EFFECT OF CROSS-POLLINATION ON ITS CROPPING HABIT.

E. C. LEVITT, H.D.A., Fruit Inspector.

Interpollination experiments have been carried out during the past two years in an endeavour to correct the erratic bearing habits at times exhibited by Willson Early plum. Rather encouraging results have been obtained, as related in the following article. The Department considers, however, that the shy bearing of this variety might also be due in some measure to the question of stocks, and this aspect of the problem is also being investigated.

NARRABEEN and Duffy's Early Jewel, having proved themselves the best of thirteen varieties tested as pollinators for Willson Early plum in 1930, it was decided to concentrate on these two varieties in a further test carried out in co-operation with Mr. G. Hitchcock, of Glenorie, during 1931. To this end the blossom of Narrabeen was placed in eleven trees of Wilson Early, and Duffy's Early Jewel blossom in fifteen on 31st August, 1931, each trial plot being a solid block and separated by eleven cross rows of untreated trees, which were used as a check.

The results are set out in the following table, which shows the weight of fruit in pounds yielded by each individual tree in the trial. Trees cross-pollinated by Narrabeen showed 100 per cent. increased yield as compared with Duffy's Early Jewel, which, however, gave 100 per cent. increase over the trees that were not cross-pollinated. The respective average yields per tree in each of the plots were 30 lb., 14 lb., and 6 lb. approximately.

It is likely that the advantage shown by Narrabeen as a pollinator may have been due to the blossom of that variety being in a better stage of development than Duffy's Early Jewel, while the Narrabeen trees from which the blossoms were obtained were also somewhat the more vigorous.

This table shows the improvement in the cross-pollinated plots to be fairly uniform, and the higher average yields are therefore not due to heavy yields by individual trees. Note that the check trees not in close proximity to the cross-pollinated plots are uniformly low in yield.

HARVEST Results, November, 1931.

Pollinator.	Willson Early Plum.				
	Tree No.	Row A.	Row B.	Row C.	Row D (Not pollinated).
		lb.	lb.	lb.	lb.
Narrabeen	1	65	24	†42½	22
	2	17	29¼	8	11
	3	32	37¾	38	10
	4	41	17	27	4
Check Plot (not pollinated)	5	32	10	27	8
	6	6	8	13	2
	7	4½	9	8	5
	8	9	4	3	6
	9	11	1½	1	1
	10	6	5½	25½*	2½
	11	9	7¼	8	5¼
	12	10	3	4	3
	13	8½	5½	6	4
	14	9¼	4	22*	2
	15	8	22½*	5½	6
Duffy's Early Jewel ...	16	16½	41½*	22*	3
	17	14½	22	19*	2
	18	15½	7½‡	10	1½
	19	16	9	6¾	1½
	20	20	17	12½	2
Not pollinated	21	28	9½	9	3½
	22	11	2½	2½	1
	23	2	3¼	6¼	1½
	24	1	1	6	¼

* These trees were sprayed with red oil during the dormant period. The sprayed trees in the Duffy's Early Jewel plot were not included when working out average production for the plot

† This tree was not pollinated. It was also left unpruned, as was also tree No. 1 in Row D.

‡ The container was upset and the blossom withered shortly after being placed in position.

An interesting variation was introduced into the experiment by the use of a miscible oil spray (1 in 22) during the dormant period. The spray was applied for the control of San José scale, and the treated trees are indicated in the table above. These trees blossomed from three to five days earlier than those not sprayed, set and matured uniformly heavier crops, and the fruit was decidedly of a better average size.

THE rigid-tine cultivator or scarifier is the most satisfactory implement to use for the later cultivations of most classes of wheat fallow. Compared with the springtooth, because it can be set to the desired depth, it does much more uniform work, makes a more even mulch, and leaves the top of the compacted sub-surface area level, not ridged. This makes for a much more uniform condition of the fallow generally, and results in a more even crop. With the correct points, or fitted with knife bars, it can deal much more effectively with weed growth, particularly thistles and melons.

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Orchard Notes.

SEPTEMBER.

R. J. BENTON, Special Fruit Instructor.

Conservation of Moisture.

GENERALLY speaking, the autumn and winter rainfall in the fruit-growing areas of the State have been sufficient, the falls being light but regular, and orchards have not suffered to any great extent. The season has now arrived, however, when the question of soil moisture supply must be very carefully considered. Where irrigation is possible, care should be taken that the soil contains sufficient moisture to enable the roots in the lower soil levels to supply the trees with the necessary food for growth and fruit development. In non-irrigated areas a cultural programme designed for the conservation of such moisture as the soil contains is essential. Completion of ploughing should be expedited, and it should be accompanied by careful hoeing around the trees to destroy weeds. It is not always realised how seriously weed growth reduces the amount of moisture available to the trees. Upon the thoroughness with which the above measures are practised will largely depend the setting of the fruit and its development to a satisfactory commercial size.

The mulching of young trees with old grass, etc., will tend to their more rapid development.

Pruning and Pest Prevention.

Pruning of deciduous trees should also be completed without delay. Owing to frost injury, citrus growers in many localities will have much work to contend with. Where the trees have been seriously injured, it is advisable to delay pruning until new growth is showing freely. The trees should not be pruned harder than necessary, which will usually mean cutting back a little below the portions killed. Some thinning out, more particularly with mandarins and lemons, is advisable, and if time permits the cleaning out of very weak and dead wood in the centre of the trees is very desirable. Such wood is useless and frequently harbours diseases which, under conditions favourable to their development, reduce the vitality of much fruit, especially on aged trees.

The present time is very suitable for "pruning-up" slightly the skirting of orange trees. Many trees, on the Irrigation Area particularly, are in need of such pruning, which considerably facilitates cultural operations. Reduction of the lowest limbs to more upward growths, so as to leave the foliage about 9 inches above ground level, is recommended. In coastal areas where the dicky rice weevil is prevalent, such pruning is especially necessary. This pest damages the rinds of much fruit in the Hills and Kurrajong district, and frequently devitalises the trees in a marked degree. Banding of the trees with the adhesive tree-banding material purchasable

for the purpose as a protection against both dicky rice weevil and root borer should already have been completed. Details of the measures recommended against the two pests mentioned are given in leaflets obtainable free from the Department.

Planting of Citrus Trees.

With the advent of spring, the planting of citrus trees is seasonable. Large quantities of trees of practically all varieties are available from nurserymen, which should ensure that any areas being extended or renewed are planted with well-developed trees. The planting of any small trees this season, especially of the main varieties, should be quite unnecessary.

Unless the land has been deeply and thoroughly prepared, however, planting should be deferred. Well-developed trees, capable of bearing large crops of good quality fruit, are the only ones which will be profitable. Citrus trees should not be planted too deeply—an inch or so higher than they stood in the nursery is advisable. The hole should be a little larger than is necessary to accommodate the roots when properly spread out. The tree having been set in position, the hole should be filled about three-quarters full with fine surface soil, and the roots well firmed. Some water should then be applied, and after this has soaked away the hole should be filled up with soil. The removal of all leaves by cutting will retard transpiration, ensuring rapid re-establishment. Some protection of the stem to within 6 inches of the head is desirable.

Citrus Diseases.

The necessity for producing a greater percentage of first-grade fruit should not need stressing, and this involves active measures against disease. Citrus scab is still much in evidence at all seasons of the year, whilst black spot may soon be visible on the Valencias now rapidly maturing. Melanose and exanthema are also causes of reduced returns. The season is at hand for action by which losses by such diseases can be largely prevented. Leaflets giving details of the treatments recommended are obtainable from the Department on request. Overhaul of the spraying outfit and purchase of spraying material is now desirable in order to ensure that there shall be no delay when application becomes necessary.

Re-working of Unsuitable Varieties.

Every tree must be made as productive as possible, and any "off types" and unpopular varieties should be converted by re-working to good standard types. Now is the most suitable time for re-heading or severely cutting back undesirable trees to enable them to make the best growth on to which buds may be eventually worked.

Warning to Banana Growers.

A note of warning is sounded by Mr. H. W. Eastwood, Fruit Instructor, Murwillumbah, with regard to banana planting, which promises to be carried out this season on an extensive scale. It is pointed out that the fact that banana prices have been good and that most growers have in consequence been doing well does not make the present time so appropriate for

the development of new areas as might be assumed, inasmuch as the product from such areas will meet with proportionately greater competition. In the writer's opinion, unless there is a proportionate reduction in another producing State, the expansion in the banana industry in New South Wales appears to be too rapid for safety.

The effect upon prices of the prospective increase in production will depend mainly on the extent to which consumption can be increased at prices profitable to the grower. A wider distribution of bananas throughout the Commonwealth and within the States will help to increase the demand. The recent action of the South Australian Government in allowing New South Wales bananas to enter that State has assisted distribution in proportion to the accommodation of the Adelaide market, and every effort should be made to win it for the New South Wales product by forwarding only good quality fruit, well graded and attractively packed.

The relatively good times in the industry are not likely to continue indefinitely, and in the struggle for supremacy the less profitable plantations, on poor land, in inaccessible places, or where the overhead expenses are heavy, are the ones that must go out. It is essential that new plantings should only be carried out under conditions which give every prospect of heavy crops of good quality fruit—after the experience of this winter it should not be necessary to remind growers that frosty situations are particularly unsuitable. Where all the conditions necessary to such crops are present, bananas are likely to continue to be more profitable than other fruit crops, but where the contrary is the case growers should consider the claims of such other crops, and, where a permanent orchard crop is desired, especially that of the Australian nut tree.

Bunchy Top and Beetle Borer.

Now that the banana-growing industry has been re-established in New South Wales, mainly as a result of the successful campaign against bunchy top and beetle borer, it is of paramount importance in the interests of the growers themselves and the State as a whole, that there should be no relaxation of the efforts to keep this disease and the borer pest under control. The regulations prescribing the control measures have now been in operation for over four years, and growers should therefore be fully conversant with their obligations in the matter. The banana industry is a valuable asset to the State, and failure to persist with the protective measures embodied in the regulations would ultimately result in the almost complete destruction of this asset, as was the case a few years ago when the industry was practically annihilated by the ravages of bunchy top.

Unfortunately, there are some growers whc are inclined to disregard the regulations now that the industry has made such remarkable recovery, and it is very necessary that this attitude should be guarded against. Departmental inspectors have been instructed that the regulations prescribing the control measures for bunchy top and beetle borer must be strictly enforced, and it is intended to institute legal proceedings against any growers who fail to comply with the law in this regard.

Stricter Export Regulations Against San Jose Scale.

Correspondence has been received from the Federal authorities drawing attention to the fact that, owing to San José scale having been detected on some recent shipments of apples and pears from Australia, the French Government has decided to impose severe restrictions on the importation of apples and pears from this country, and it is pointed out that the position is regarded in such a serious light that it is feared that not only may France prohibit entirely the importation of Australian fruit, but other continental countries may be tempted to do likewise. A very disquieting feature of the report received is that this scale was found to be present by the French authorities in portion of a shipment of apples from New South Wales.

In view of the seriousness of the matter, the Federal authorities propose to take immediate steps to tighten up the export regulations by the re-introduction of the conditions which existed prior to 1927. This means that not only will fresh fruit affected by San José scale be prohibited from being exported, but so also will clean fruit which has been in contact with affected fruit, or which has been produced in any orchard where that scale exists.

It is therefore in growers' own interests that they should make every effort to control this scale. Information in this connection is contained in a pamphlet obtainable from the Department.

To Avoid Poisoning Bees with Lead Arsenate Spray.

THERE is no danger of poisoning bees with arsenate of lead spray, when used on apple and pear trees for codling moth control, provided the first or calyx spray is applied at the correct time.

The Regulations dealing with the control of codling moth require that the first spraying of arsenate of lead be applied when most of the petals have fallen. This is the earliest that the spray can be applied to be effective, enabling the arsenate of lead to enter the open calyces after the petals have fallen and before the calyces close.

It is rcognised that bees, apart from their commercial value as honey producers, have the merit of fertilising the flowers of fruit trees, thus ensuring the set of fruit. Therefore, it is in fruitgrowers' interests to spray at the correct time, both to obtain the best control of codling moth and at the same time to avoid the possible poisoning of bees. The over-zealous grower who sprays his apple and pear trees too early, that is, when the trees are in full bloom, is not only wasting much spray, but is also endangering the lives of bees, which, as already indicated, are necessary for fertilisation and the satisfactory setting of the crop.

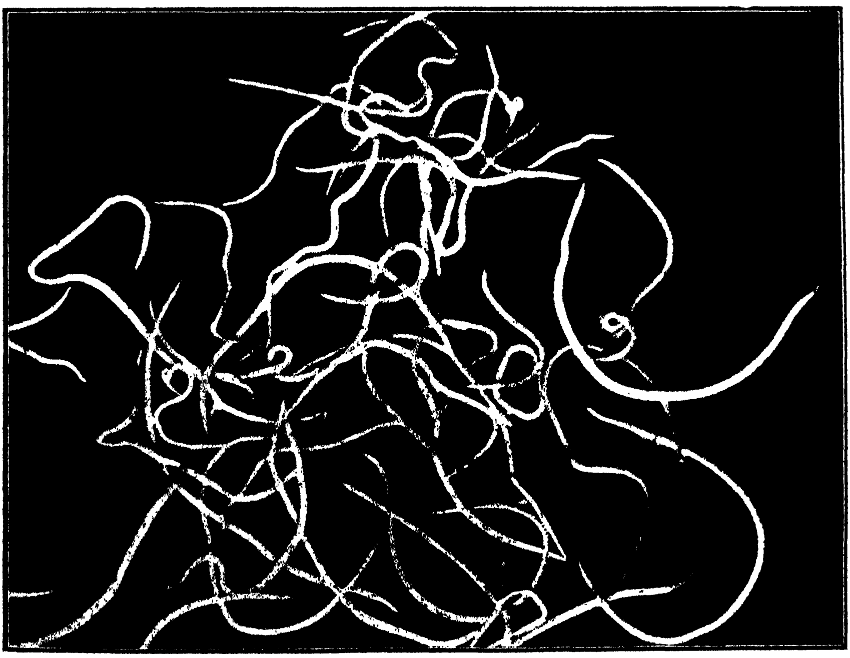
Later applications of the spray are no menace whatever to bees, as they are made long after blossoming, when the bees are not attracted to the trees. After the first spraying two more applications have to be made at intervals of three weeks, and a fourth carried out four weeks after the third spraying. The spray to use is 1½ lb. lead arsenate powder (or 3 lb. lead arsenate paste) to 50 gallons of water.

Round Worms in Poultry.

W. J. B. MURPHY, B.V.Sc., H.D.A., Government Veterinary Surgeon.

INTENSIFICATION of poultry farming practice has gone hand in hand with the increasing prevalence and importance of round worm infestation and has made the question of control of the latter a very vexed one.

In nature there is invariably a balance between host and parasite which prevents the predominancy of the one over the other to the material disadvantage of either. Domestication in the case of fowls, where their range is restricted to a small pen or even to a house, robs them of nature's protection by destroying this balance, and in the battle for supremacy gives the parasite a decided advantage over the host. Such is the case with worms. Worm



Round Worms (*Ascaridia lineata*) from the Small Intestine of a Fowl.

eggs passed in the droppings of the undomesticated fowl were scattered over an extensive area of country. Most of them perished, only a few being picked up again by birds, where, on reaching the intestines, they developed to maturity, produced further eggs, and so the cycle went on in a balanced manner.

On poultry farms birds are concentrated year after year on the same piece of land, and this means concentration of worm eggs on that same area, making it increasingly difficult for birds to escape worm infestation under such conditions. Each bird in addition becomes infested to a degree far in excess of its tolerance, and the effects are recognised in terms of disease.

Round Worms Found Affecting Poultry.

A few of the round worms characteristic of those which have been found affecting poultry may be mentioned. In Queensland the eyeworm (*Oxyspirura parvovum*) locates itself in and does considerable damage to the eyes of poultry. It does not occur in the poultry farming areas of New South Wales. The gape worm (*Syngamus trachea*) of poultry lodges itself in the windpipe, causing symptoms termed "gapes." Its presence is very rare, if it exists at all, in this country.

One of the commonest, yet most innocuous of worms found in the domestic fowl is the caecal worm, *Heterakis gallinae*. Its location is in the caeca or blind pouches of the intestine, and very few birds when opened will be found free from it. Usually it does not seriously affect the health of birds parasitised, and special treatment is seldom indicated or undertaken.

The crop, glandular stomach and gizzard are the seats of infestation of a varied assortment of round worms, many of which exist in this State. Their importance, however, is subordinate to that of *Ascaridia lineata*, the common round worm of poultry (see Fig.), which is to be found in the small intestines. Further discussion in this article will deal solely, unless otherwise stated, with the various aspects of infestation and control of this particular worm.

Examination for Worms.

Worm infestation may be diagnosed by the demonstration of eggs in the droppings of affected fowls. This, of course, can only be undertaken in a laboratory. Occasionally live round worms will be observed in the droppings.

The best indication of the presence or otherwise of worms is the general condition of the growing stock. If on account of unthriftiness or other symptoms worms are suspected, final determination may be made by killing a backward bird and conducting an examination on the intestinal tract. In this examination a pair of blunt-pointed nail scissors will be found of great service. Free the gut from its attachments, and, commencing at the gizzard, open it along its entire length. Round worms, if present, will be found in that portion of the intestine between the gizzard and the caeca.

Poultry-farmers are strongly advised never to miss an opportunity for opening and examining birds which die from any cause on their farms. Even the intestines of birds killed for table purposes should be examined, for observations made from these will serve as an index to the general state of health of the flock.

Life-history of the Common Round Worm.

One adult female member of the *Ascaridia* species may produce over 10,000 eggs, which are liberated into the intestinal canal of the affected bird and ultimately voided in the droppings. Each egg is provided with a tough resistant capsule which protects the enclosed embryo from adverse environmental conditions. Extreme cold will not kill them, but they are very susceptible to hot, dry conditions. After the egg has been voided an incubation period of at least seven days, but usually from ten to twenty days, is essential before the embryo reaches the infective stage; that is, if taken into the bowels before the infective stage is reached development into an adult worm will not take place. Once the infective stage is reached the embryo, still protected by its shell, may survive for over three months. Warm moist shaded aspects favour this long survival. The embryonated eggs hatch when taken into the digestive system of fowls with the food, water or greenstuff, and small larvae emerge which burrow into the mucous membrane lining of the small intestine. After about one week the larvae emerge again into the cavity of the bowel, where they remain, and in from one to two months reach maturity.

Effect and Symptoms of Round Worm Infestation.

Among poultry-farmers there is a prevalent idea that the harbouring of a few worms is quite a normal condition and that no harm results therefrom. That worm infestation in any degree in fowls is a normal state of affairs cannot be accepted, although it is admitted that many birds which are in a healthy condition will be found, when opened up, to have a small number of worms present in the bowel. The point is that once a female worm reaches maturity she may give off vast numbers of eggs, which, when passed out, will accumulate on the ground and in the houses of the run. It must be quite obvious that the eggs given off by a small number of worms do nothing else than pave the way for a heavy infestation to follow.

One might ask: "What constitutes a heavy and a light infestation of worms, and what number may a bird harbour without the manifestation of ill effects?" The answer is difficult, as the effects of worm infestation depend upon the age and individual susceptibility of the bird affected more than upon the actual number of worms present. Individual susceptibility is intimately bound up with natural resistance to disease; it is dependent largely upon the state of health and nutrition of the bird. The presence of one disease obviously predisposes to others by lowering the natural body resistance. This is equally true with regard to nutrition. Birds which are inadequately or improperly fed (or both) show the effects of worm infestation (*i.e.*, disease) in its worst form. Greater susceptibility to round worms is shown by birds fed on a diet deficient in vitamins. Resistance to the effects of round worm infestation increases with the advancing age of the bird. Severe effects are seen in birds under three months old when only a few worms are present. Between the ages of three and twelve months an

increasing number of worms are necessary to produce the same effects. Beyond this age affected birds are more important in that they act as carriers and spreaders of the parasite. The presence of any other condition which lowers the bird's powers of resistance will render them more susceptible to the effects of worm infestation.

The symptoms of worm infestation are sluggishness, unthriftiness, ruffled and dull plumage, general paleness and anaemic appearance, loss of body weight and condition, retarded development and lowered resistance to disease. Occasional deaths may result. Diarrhoea, with the presence of small amounts of dark blood (not bright blood—this is more likely to be coccidiosis) may be noted. Internally, inflammation of the intestines will usually be seen. Round worms have also been credited with causing certain forms of "leg weakness."

The presence of symptoms similar to the above should be an incentive to the poultry-farmer to make an examination for worms or submit an affected bird to a veterinary laboratory for this purpose.

Preventive and Control Measures.

There is more to be gained by prevention than by waiting for birds to become affected and then attempting treatment. That worm infestation is the forerunner of a number of other disease conditions, with consequent heavy culling, or even mortality, will not be denied by poultry-farmers. There is only one way that a bird can become affected with round worms and that is by having access to and taking in worm eggs. Worm eggs can only result from a worm-infested fowl. The basis of prevention then is sanitation. The health of the growing stock should be regarded more or less as sacred. It is before birds reach the stage of production that they are most susceptible and should consequently be given most attention. Special quarters should be provided for the growing stock, and between seasons these pens should not be used by adult stock, as they may contaminate them with worm eggs. Where possible it is advisable to remove the surface 3 inches of earth in the weaning quarters and replace it with virgin soil before the birds are placed in them; even if done only in the precincts of the house much benefit will result. Overcrowding of young stock cannot be too strongly condemned, as when worm infestation occurs under such circumstances the effects will be severe and control difficult. In large roomy runs the worm eggs if present are scattered lightly over the whole area and the likelihood of birds becoming heavily infested is thereby reduced.

Shade trees in fowl runs should be reduced to a minimum. Shady and badly-drained runs provide the suitable moist conditions which favour the development and survival of worm eggs, whereas in the absence of moisture they are killed by exposure to direct sunlight. Houses should be well ventilated, open-fronted and facing the north-east in order that as much sunlight as possible will enter them. The laying down of concrete floors in all houses is strongly advised. Earthen floors can never be cleaned properly,

and brick floors, unless plastered over, are absorbent and tend to remain moist. Houses should be thoroughly cleaned before young birds are placed in them.

The most important factor in worm control is the regular collection and disposal of droppings. If worms are present their eggs are present in the droppings. Houses and runs must be cleaned out thoroughly at least once a week; the more often they are cleaned the more effective will be the prevention and control of those parasites. An excellent scheme is to have that area of the house immediately under the perches completely enclosed with wire-netting. The greater proportion of the droppings are passed while the birds are on the perches and the wire-netting allows them to fall through on to the ground but prevents the birds having access to them. The periodic spraying of the house with a 3 per cent. solution of phenol will keep it in a sanitary condition. Disinfectants are not of much use in destroying worm eggs, but if the floors are scrubbed and soaked with a *boiling* disinfectant solution all eggs and coccidia, in addition to germs, will be killed. Droppings should be conserved as far away as possible from the fowl runs and no bird should have access to them.

Water supply should be arranged so that it will not become contaminated with droppings. Leaking or overflowing vessels will provide a moist area of ground which will favour the development of worm eggs. All feed, but particularly the morning mash, should be given in clean troughs. If fed on bare ground contamination with worm eggs easily results. Adult stock should never be mixed or housed with or next to young birds, as adult birds are often carriers of worms and may serve to infest the young ones. A sound practice, even with adult birds, is to rotate the yards as much as possible, and so help nature in controlling worm and insect pests.

It is essential that the resistance of growing birds should be kept up. It has been definitely proved that birds on a diet deficient in vitamins show a greater susceptibility to the effects of worm infestation than when the diet is balanced. Adequate green feed, the main source of vitamins, should always be provided.

Finally, it has been found that badly worm-infested pullets are unfit subjects for vaccination against fowl pox and serious results follow if such birds are vaccinated. For this purpose it is essential for them to be free from all disease and parasitic conditions.

Treatment of Affected Birds.

In well-cared-for flocks, treatment for round worms should not as a rule have to be undertaken if correct preventive measures have been adopted. It is very difficult to get a drug which will expel *all* worms from a fowl or, indeed, from any animal. A number of drugs have from time to time been recommended for use against round worms. Those which have given most satisfactory results are nicotine in the form of tobacco dust, and tetrachlorethylene, which is sold in capsule form; the former is used for mass or flock treatment, while the capsules must be given individually to each bird. Individual treatment is admittedly slow and laborious, but it ensures that

each bird gets its treatment, and, further, that it gets the correct amount of the drug. With flock treatment this is not the case, because the worst affected birds take so little food that they do not get a full dose of the drug.

Tobacco Dust Treatment.—This treatment consists of mixing tobacco dust at the rate of 3 per cent. (3 lb. per 100 lb.) to the dry ingredients of the mash each morning and it must be continued for four weeks. At the commencement of treatment smaller amounts of tobacco dust should be added for three or four days, gradually increasing to the full 3 per cent. Laying birds will not reflect this treatment to any marked extent in their egg production. All the preventive and control measures should at the same time be adopted when this or the following treatment is undertaken.

Tetrachlorethylene Treatment.—Tetrachlorethylene is made up by proprietary firms in capsules, and is obtainable from universal stores or leading druggists in Sydney. Two sizes are used for poultry, *i.e.*, half cubic centimetre and one cubic centimetre capsules. The smaller ones are given to pullets up to the age of nine months, while the larger ones are used for adult fowls or roosters. The capsule is administered by placing it well down the throat of each bird with the aid of the little finger. Treatment must be undertaken before the birds have had their morning mash; if hoppers are in use these should be closed up the previous night.

Most of the worms are passed within four hours following treatment, and it is necessary, therefore, to conduct a regular clean up of yards and houses on the same day as the capsules are given. Feed should not be allowed for two or three hours after the birds are treated. An excellent scheme in treating birds with these capsules is to place all birds as treated in a wire-floored crate and allow them to remain there for three to four hours, during which time all worms passed will collect underneath where they may be easily collected and destroyed. Owing to the fact that the surroundings are already contaminated with worm eggs, a second treatment with these capsules should be given four weeks later. Although both tetrachlorethylene and nicotine cause round worms to be expelled from the body, neither the worms nor their eggs are killed by these drugs (they are vermifuges, not vermicides).

Treatment with capsules will cause a drop in the egg production of laying birds that may last for upwards of a week. Birds which have been freed from a heavy worm infestation, however, will soon catch up and surpass their pre-treatment record.

When it is known that birds are worm infested, treatment should be undertaken as early as possible; if this is not done the condition of the flock may be lowered to such an extent that some of the worst affected birds will not be able to withstand the slight reaction to this treatment.

In conclusion, it must be pointed out that neither of these two treatments will be effective in removing tapeworms from poultry, for which purpose the drug kamala is used. Tetrachlorethylene and kamala should never be used together. If birds are to be treated for both types of worms a period of one week should elapse between the treatments.

Poultry Notes.

SEPTEMBER.

E. HADLINGTON, Poultry Expert.

The Problem of Increased Feeding Costs.

OWING to the recent increases in the price of pollard and bran and the difficulty of obtaining supplies of these commodities there have been numerous inquiries as to what substitutes may be used.

It is a most serious matter for the poultry-farmer that there should be any upward tendency in the cost of foodstuffs at the present time, because the average price of eggs is lower, and on present indications, therefore, the net returns will be considerably less than for the past year. Even with the much lower prices ruling for most poultry foods last year, particularly pollard and bran, the return over cost of feeding, based on an average production of twelve dozen eggs per bird for the year, worked out at only 6s. 9d. per hen, whereas in normal times a nett return of 10s. per hen per annum is regarded as necessary to return a fair living. It is manifest that with a lower average price for eggs, and faced with a material increase in the cost of feeding, poultry-farmers will have to consider every possible means of lowering feeding costs if they are to make even a bare living.

The position will, perhaps, be better visualised when it is pointed out that every 1d. per dozen decrease in the average price of eggs means, on the basis previously mentioned, a reduction of 1s. per hen per year, and for every 10s. per ton increase in the prices of pollard and bran, the cost of feeding is increased by 2¾d. per hen, likewise every 1d. added to the cost of wheat adds nearly another 1d. per hen.

Unfortunately at the moment the only substitutes for pollard and bran available at comparable prices are rice pollard and lucerne chaff, but in order to ease the demand for pollard and bran every poultry-farmer could use a proportion of wheatmeal. It should not be thought, however, that wheatmeal is superior to pollard or that it can be obtained any cheaper while present values rule, but a reduction in the consumption of pollard and bran would have a steadying effect on prices.

How Substitutes may be Used.

Following are suggestions for the use of various substitutes to form a balanced ration for adult birds when fed in conjunction with the evening meal of grain:—

1. Pollard	33 lb.	2. Pollard	30 lb.
Wheatmeal	33 lb.	Rice Pollard	30 lb.
Bran	14 lb.	Bran	18 lb.
Prime Lucerne Chaff	13 lb.	Prime Lucerne Chaff	15 lb.
Meatmeal	7 lb.	Meatmeal	7 lb.
Salt	22 oz.	Salt	22 oz.

3. Pollard ...	20 lb.
Rice Pollard	20 lb.
Wheatmeal	30 lb.
Bran	13 lb.
Prime Lucerne Chaff	10 lb.
Meatmeal	7 lb.
Salt	22 oz.

4. Rice Pollard	35 lb.
Wheatmeal	35 lb
Bran	10 lb.
Prime Lucerne Chaff	13 lb.
Meatmeal	7 lb.
Salt	22 oz.

Each of the above mashes, less the salt, makes 100 lb. In each the lucerne chaff may be replaced by bran without materially affecting the balance, or, in cases where an ample supply of greenstuff is available, up to 25 per cent. of such material finely chaffed may be used in place of the lucerne chaff and portion of the bran, but additional green feed may also be given at midday. If a dry mash is used the quantity of salt should not exceed 12 ounces per 100 lb.

It will be noted that 7 per cent. of meatmeal is included in each of the alternative rations in place of 6 per cent. usually recommended, and the question may be raised as to why this is done. The reason is that both wheatmeal and rice pollard contain a higher percentage of carbohydrates and fat and less protein than does wheaten pollard, and the extra meatmeal is required to supply the additional protein necessary to balance the rations. The quantity of meatmeal is based upon a product containing 60 per cent. protein, and, therefore, if a meatmeal of higher or lower protein content is used the quantity should be reduced or increased accordingly.

A Simple Ration that gives Good Results.

For purposes of comparison and as evidence that a simple and economical ration will give consistently good results, particulars of that fed to birds in the Hawkesbury Agricultural College egg-laying competition and at the various Government farms may be quoted.

Morning Mash—	
Pollard	60 lb.
Bran ...	34 lb.
Meatmeal	6 lb.
	100 lb.
Salt	22 oz.

Evening Feed—	
Wheat ...	66 lb.
Cracked maize...	34 lb.
	100 lb.

This ration, with or without lucerne products, has been recommended by the Department for many years, Up to 15 per cent. of good lucerne chaff, meal or dust could take the place of that quantity of bran, if price permits, without affecting the "balance" of the ration. However, despite the evidence before poultry-farmers of the efficiency of this ration many have been prone to adopt much more costly methods of feeding without securing any corresponding increase in production.

With regard to the evening feed, the only way to reduce the cost is to use less maize for the adult birds, as there is no other cereal available at the moment at rates cheap enough to compare with wheat, and, although one is reluctant to advise this course on account of the beneficial effects of maize, the present prices are almost prohibitive, and the use of maize must therefore be mainly restricted to breeding stock and chickens.

Cost of Feeding Chickens.

Many poultry-farmers have only a very hazy idea of the cost of feeding chickens to any given age, and usually when an attempt is made to calculate the cost, a much higher figure is arrived at than is actually the case. It is on account of this that numerous farmers assert that it does not pay to rear the cockerels to an age at which they will realise good prices in the market. Consequently thousands of immature birds are thrown on to the market, causing a glut, which results in lowering prices all round, including those for the better class of cockerels, and the small birds are sacrificed at a loss to the producer.

In order to give some authentic information on the subject an analysis has been made of the quantities of feed consumed by chickens up to twenty-four weeks old, fed on the chicken ration recommended by the Department and based on prices which would be paid by the average poultry-farmer at the present time. To ascertain the quantities a careful record was kept of the feed consumed by 500 chickens over each period of four weeks up to twenty-four weeks. The costs were as follows:—

1st four weeks period	... ...	¾d. per chick.	
2nd ,, ,,	... ...	2d. ,,	
3rd ,, ,,	... ...	4d. ,,	
4th ,, ,,	... ...	4d. ,,	
5th ,, ,,	... ...	4½d. per bird.	
6th ,, ,,	... ...	6d. ,,	
Total for twenty-four weeks	...	1	9¼

In order that any poultry-farmer may compare prices, the costs upon which these figures were worked out are:—

	£	s.	d.	
Pollard and bran	6	13	6	per ton.
Wheat	0	4	0	per bushel.
Cracked maize	0	5	9	,,
Kibbled wheat	0	4	9	,,
Kibbled maize	0	6	9	,,
Hulled oats	0	8	4	,, (40 lb.)
Rolled oats	0	0	6 lb.	
Milk powder	0	0	6 lb.	
Bonemeal	0	0	2 lb.	
Meatmeal	0	0	1½ lb	

These prices should be as near as possible the costs landed on the average farm in the County of Cumberland.

The small farmer who has to buy feed in bag lots would, of course, have to pay higher prices for most of the items enumerated, and would probably require to add 10 per cent. on to the cost of feeding, which would increase the cost by 2d. per bird to feed for six months.

In considering these figures it must be remembered that the early hatched birds, if well reared, can usually be marketed at about four months old and realise higher prices than those hatched late in the season would bring at five to six months old. In fact the June and early July birds can be disposed of when ten to twelve weeks old, at which stage they have only cost

4¾d. to 6¾d. each to feed. Why then sacrifice the young cockerels as soon as the sex can be determined and suffer a greater loss, besides depriving the consumer of birds of a suitable size?

Unsuitable House for Layers.

In recent years there has been a development in the construction of houses and runs for layers which is, to say the least, undesirable, and will lead to much trouble in the course of time. This is the "long shed" system, which appeals from the point of view of saving labour, but the elimination of labour, while essential where efficiency is not impaired, is false economy if carried out at the expense of the welfare of the birds. The system of housing referred to is that intended for semi-intensive accommodation, and comprises a shed of perhaps 100 feet and over in length, having a width of about 15 feet or more, and divided into a number of compartments of anything from 20 to 30 feet, with runs of the same widths as the lengths of the respective compartments of the house. Although the runs may be of considerable length, it does not alter the fact that the birds mostly congregate in front of the house, which, in a short time, results in the ground near the houses becoming contaminated and eventually "fowl sick." If, as is often the case, the houses are used without a plentiful supply of scratching litter, and the birds are not shut in during bad weather, this trouble is accentuated. It requires little imagination to visualise the insanitary condition of such narrow runs during wet weather if the birds are allowed out.

The importance of maintaining in a sanitary condition the ground upon which the poultry runs are built is probably not fully realised by many of those engaged in the poultry industry in this country, but in the older countries this factor has to be carefully considered. Not only does overstocked land become impregnated with bacteria inimical to the health of the stock, but the beneficial mineral elements in it become depleted, and it does not appear to be possible to correct this deficiency satisfactorily by artificial means. This is a factor which advocates of intensive housing of poultry apparently do not fully consider, yet, together with the sunshine, it is a major consideration where poultry is kept on the same area for many years.

It is, therefore, desired to impress upon those contemplating the building of houses for layers on the semi-intensive system, which is the ideal method, to make provision for runs of a suitable width to each house, and in this connection a desirable size for 150 to 200 layers is a run 1 chain wide by 2 chains long (66 feet x 132 feet), and where the houses are to be built on the one line it is a good plan to build them in pairs, leaving the necessary space between for the width of the runs. There is not much objection to erecting houses, say, up to 90 feet long, with three divisions, except that it involves taking the two end runs out practically the whole width beyond the ends of the houses, with the result that the birds in those pens do not have the protection of the front of the house from cold winds.

CONTENTS.

GLENCARNOCK REVOLUTION (imp. CANADA) (31939).

[Stationed at Trangie Experiment Farm.]

The "Trangie" Aberdeen-Angus Stud is founded on the world-famous "BLACKCAP REVOLUTION (27530-C.A.A. Soc.), blood of "GLENCARNOCK" (Canada).

Full particulars from—

THE UNDER SECRETARY, DEPARTMENT OF AGRICULTURE,
Box 36a, G.P.O., SYDNEY.

Agricultural Gazette of New South Wales.

The Need for Improvement in the Baking Quality of Australian Wheat.

H. WENHOLZ, B.Sc.Agr., Director of Plant Breeding, and
S. L. MACINDOE, B.Sc.Agr., Assistant Plant Breeder.

To the late William Farrer, pioneer wheat breeder in Australia, a vast amount of credit must be given for the improvement in the rust resistance, yield, and quality of Australian wheat. Coincident with the production of Farrer wheats, the wheat belt was extended considerably into districts of less rainfall. Although some definite improvement was made by Farrer in the inherent rust resistance of varieties of wheat, it was the extension of the wheat belt into drier districts, together with the breeding of early-maturing rust-escaping varieties, which was largely responsible for the greater production of better quality grain from this standpoint. This alone was an achievement of enormous significance to Australia, when it is reflected what a large toll of the yield and quality of grain was taken by rust in pre-Farrer days.

Farrer's Early Interest in Baking Quality.

Farrer was also one of the first wheat breeders in the world to concern himself with the improvement of wheat from the standpoint of milling and baking quality. Even before the end of the last century Farrer secured the co-operation of the Chemist's Branch of the New South Wales Department of Agriculture in having his crossbred wheats milled and tested for gluten content and water absorption.

Accompanying the extension of the wheat belt into drier districts, there was also a natural increase in the protein content of Australian wheat. Before this extension took place, the French Government had invited tenders for flour contracts, specifying that the gluten content (as an indication of flour strength) should not be less than 9 per cent., which was about 1 per cent. more than the gluten content of the best wheat harvested in New South Wales at that time. To-day the gluten content of our wheat runs up to 12 per cent. or more in dry districts, and the average of Australian wheat is seldom below 10 per cent.

Since 1914 there has been no marked extension of the wheat belt into drier districts, and no general improvement in the inherent quality of Australian varieties, so that the general character of Australian wheat has not improved to any extent in baking quality since the improvement made by this extension of the wheat belt which was made possible by Farrer wheats.

Farrer certainly produced some wheats, viz., Comeback, Cedar, Bobs, Jonathan, which, for inherent quality, rank well with the world's best, but these varieties never made much headway in cultivation because they were not productive, and they are not now grown except on small areas, mostly

for show or exhibition purposes. With the exception of Florence, all the Farrer wheats which went into commercial cultivation are still of inherently weak or medium weak flour strength, and it can only be concluded that it was largely the effect of the extension of the wheat belt into drier dstricts which raised the gluten content of Australian wheat above what it was in pre-Farrer days. In dry seasons or in dry districts the percentage of protein (gluten) in Australian wheat is so high as to class it as medium strong on this basis.

Changes Due to World Trade.

In the earliest days of wheat growing in Australia, and even up to the time when Farrer began his epoch-making work, there was no surplus wheat for export, and Australian millers and bakers handled the soft wheat and the weak flour then produced fairly satisfactorily. As a matter of fact Farrer's attempts to improve the baking quality of Australian wheat to the standard of the Fife wheat of Canada were vigorously opposed by the millers of the day. However, these wheats of such high quality which Farrer produced, viz., Comeback, Cedar, Bobs, Jonathan, etc., did not remain long in cultivation after the production of Federation and similar wheats of higher yielding capacity. Federation and the other Farrer wheat which went into commercial culture contained little of the Fife quality, and, as has been pointed out, it was the general improvement in the gluten content of the wheats grown in the drier climate which enabled Australian wheat to meet the first demand from international trade for a specific gluten or quality requirement.

Since that time many changes have taken place in international trade in wheat and flour, and being one of the leading wheat exporting countries of the world, Australia has been affected by those changes. The demand for Australian wheat is now influenced to a large extent by the specific quality requirements of each importing country.

Since Farrer's time, also, progress has been made in the production of varieties of improved yielding capacity, and in general these have not been any improvement in flour strength or baking quality. If anything, the better yielding varieties which have replaced the Farrer wheats have been of slightly weaker flour strength. This is a natural tendency which can only be averted by special measures in breeding for higher quality in combination with high yielding capacity. Until recently there has been little or no incentive to breed for improved baking quality in Australia, nor has there been any sufficiently reliable method available to the breeder, apart from the determination of the protein or gluten content, of estimating the baking quality of new strains on a small sample of grain.

Previously Australian wheat brought approximately an equal price with other wheats in the markets of the world, and it is only within recent years that it is being found that preference in the form of higher prices is more consistently being given for hard or strong flour wheats.

In some wheat-growing countries, Canada, Northern U.S.A., and parts of Russia, for instance, the winter climate is so severe that spring wheats must be grown. The wheats grown under these condtions tend to be hard in texture and of high protein content. Such wheats were at first disliked by millers, but with the introduction of the roller process of milling during the latter half of the nineteenth century they began to find favour, especially since it was found that they produced flour of better baking quality. Thus there began in international trade a keener competition for hard wheat of high quality, which was to some extent reflected in the price. Such wheats were particularly sought after by those importing countries whose home-grown wheat was very soft in character, viz., Great Britain, France, Belgium, Germany, Netherlands, Norway, Sweden, Denmark, etc.

Recent Changes in Milling and Baking Industries.

In the early days of wheat growing in various countries the milling of wheat was necessarily localised on account of the difficulties and cost of transportation, and the consuming public had to be satisfied with the class of bread which was produced from local flour. As the facilities for transportation improved, the millers in each country utilised the resources of that country for buying different classes of wheat for blending into a flour more satisfactory for baking purposes. When international trade developed, a still further blending of the different national types was practised to meet the demands of the bakers for more uniform and better quality flour.

During all this time changes were necessarily taking place in the milling and baking industries in most countries. In Great Britain and Europe, which are the chief wheat importing countries, milling came to be concentrated in large mills at the seaports, and in other countries in the large cities with their increasing populations, and also in or near large wheat-producing sections. Thus the art of blending wheat from different sources became more or less skilled, and increased attention was paid to the quality of the grain by millers and wheat buyers. In U.S.A. and Canada this development resulted in the evolution of a series of grades which were a general indication of baking quality. In U.S.A. grain quality was recognised still further by the buying and selling of hard wheats on the basis of protein content.

Following the concentration of milling in large units, and also as the result of the general tendency towards the greater mechanisation of industry, the baking industry has also in recent years come to be concentrated in larger plants with increased use of machinery. This development may not mean that the larger bakeries are more dependent on high quality flour than before, but that more exact quality specifications of flour are now being demanded. Whereas high protein was once considered to be almost the only factor of importance in determining baking quality, it is now realised that gluten quality is now an equally or even more important factor.

A good percentage of protein still remains the first essential to good baking quality or value, for without this the flour cannot be of high water absorption and the baker cannot get high bread yield, nor will low-protein flour stand mechanical dough mixing, which punishes the gluten somewhat more severely than hand mixing. In order that a dough should stand up to such mechanical mixing and should possess the fermentation requirement and tolerance demanded by large bakehouses, it is necessary that the gluten of the flour should be of high quality as well as of satisfactory protein content.

Export Quality Requirements of Australian Wheat.

In U.S.A. and Canada, where high-speed mechanical dough mixers are used in the modern bakery, the best bread is made from high quality wheat. As far as Australia is concerned, consideration must chiefly be given to the quality of wheat demanded, or most desired, by the countries to which our wheat or flour is exported or is likely to be exported.

The United Kingdom is the largest wheat importing country, about 250,000,000 bushels being imported annually, of which about 50,000,000 bushels is Australian wheat or flour. The following is taken from a report by R. Newton, published by the National Research Council of Canada in 1930:—

British millers like to use about 40 per cent. Manitobas in their mixture, when prices warrant it; occasionally, the proportion may be increased to 45 per cent., but this is about the maximum which can be used without making the flour unsuitable for baking by ordinary English methods. These restricted proportions of Canadian wheat in English blends represent a great change from conditions which obtained some years ago when London millers used from 80 to 90 per cent. Manitobas and 10 to 20 per cent. domestic wheat. Changes in methods of baking are partly responsible for the declining percentage of Manitobas in English blends. The growing use of panned bread, in which the sides of the loaf are supported, has made strength less imperative. The advent of the eight-hour day has hastened a trend towards shorter fermentation in which less strain is put on the stability of the dough; in which in fact, weaker flours must be used since doughs made from strong flours would not have time to ripen properly and would give poor loaf volume.

In a recent letter to the junior author, Sir Albert Humphries, Chairman of the Home Grown Wheat Committee, who is one of the leading authorities in England on baking quality in wheat, states:—

The strength or weakness of a flour depends to a very great extent on the baking processes to which any given flour is subjected. There is no definite standard of excellence in these matters, so that the degree of strength or weakness depends largely on the opinion of the baker, and that in turn depends largely on the baking process used. Speaking very broadly, the differences in the method of manufacture which have occurred in recent years tend to diminish the degree of strength required, and even in breadmaking there is, and, so far as one can foresee, there is always likely to be, a demand on the part of British millers for a substantial proportion of weak wheats. But, as matters stand, there is a demand for a substantial proportion of strong wheats. The relative values of strong and weak wheats will depend upon the demand and supply of these arbitrarily stated groups. It happens that at present (May, 1932) really strong wheats are in relatively small supply.

In one or two years in the last twenty, the average Australian wheat received in this country has been relatively strong. But, very broadly, I should say that the overhead trend has been towards a general falling off in the strength. I have

from time to time received a large number of samples of differing Australian varieties, and some of the newer ones do not recommend themselves, judged by appearance.

Dr. D. W. Kent-Jones, the eminent cereal chemist of Woodlands Ltd., Dover, which firm makes a feature of examining wheat and flour from different countries, states (*Milling*, 2nd April, 1932):—

> Although Australian wheat and flour were probably never as weak as some British millers considered them a few years ago, they cannot be classed as of the strength which the British miller needs in his blend. Australian wheat has many useful characteristics already well known: it mills well, gives a good length of excellent coloured flour and is certainly not lacking in flavour. Where a long length of patent is required, Australian wheat is particularly useful, but very often the home miller is prevented from using as much of this wheat as he would like owing to its obvious defects, viz., lack of general strength and low sugar content. It is not the wisest policy to increase the production of wheat of baking quality similar to those already existing or below that standard.

In Scotland the baker uses a "sponge" process in which the dough is subjected to a long fermentation period, and a high percentage of strong flour is required for this purpose.

China and Japan are Australia's next best customers for wheat, and although this market desires at present about twice as much weak as strong flour or wheat, there are signs that a greater proportion of strong flour wheat will be in greater demand there in the future.

Economic nationalism in European countries has lately been responsible for an intensive production of domestic wheat which is of the weak flour type. Local millers have been compelled to use such wheat largely, even though it means the production of lower-grade bread. But it seems certain that whatever wheat is imported in future by these European countries will need to be of strong flour quality approaching that of the Canadian Manitoba.

Egypt, which is Australia's best customer for flour, lately imposed an additional tariff of 100 per cent. on flour containing less than 12 per cent. gluten, which would have excluded practically all Australian flour, but this quality requirement has since been removed.

New Zealand is a potential market for Australian wheat in years of local crop shortage, and as New Zealand mostly produces weak flour wheat, this market mostly desires wheat of strong flour quality.

In the chief wheat importing countries, therefore, the general demand in the future is likely to be for a substantial proportion of strong flour wheat. In Australia itself there is also a growing demand for flour of improved baking strength.

Economic Considerations.

Australian wheat breeders are at present facing a big responsibility on the question of quality improvement in wheat. It is obvious from the position in most countries where Australian wheat finds an export market, and in view of recent changes which have taken place in the baking industry, that the quality of Australian wheat needs some improvement. The vital question is, to what extent can improvement in the quality of Australian wheat

be effected without lessening the return to the grower, or, perhaps, what changes in the quality and marketing of Australian wheat are necessary to improve the return to the grower.

There are some people who state emphatically that Australia should produce wheat wholly or largely of the quality of Manitoba. It must first of all be realised that it is very doubtful whether the wheat-growing conditions and the climate of Australia, except for certain parts, lend themselves completely or largely to the production of such wheat. Some tests have already shown that the quality of Marquis wheat deteriorates under certain conditions in New South Wales, but further tests are necessary to obtain more definite information on the climatic influences which different parts of the wheat belt have on the quality of different wheats, especially of wheats of high quality.

The next point to be determined is whether Australian wheats of a quality equal to Manitoba can be produced without diminishing the yield or the return to the grower. Farrer's failure to combine heavy yields and high quality does not entirely dismiss the possibility of effecting this combination, but the experience of breeders in general is that under certain climatic conditions high quality is generally attained at some expense in yield. However, it is possible that improved methods of testing wheats for inherent quality of gluten, which have never been previously available to breeders, may now lead to greater success in attaining this objective at least in some districts.

The third question for consideration is whether Australian wheat of the quality of Manitoba can be marketed to advantage. Such wheat would mostly compete with Canadian and Russian strong wheats for blending with weaker wheats. It would not seem desirable that Australia should too greatly disturb the present balance of strong and weak flour wheats by changing the whole character of her wheat from weak to strong. But this is hardly possible. During a recent visit to England, the junior author was informed by English buyers of high repute, that with the relative quantities of hard and soft wheats remaining the same, an Australian strong wheat would command a premium over every other wheat. Moreover, at present prices, there is a tendency if anything, for the marginal high protein areas in some countries to go out of cultivation. On the other hand, we have the opinion of Sir Albert Humphries, who, in a recent letter, states: "When we are discussing the desirability of altering the type of Australian wheat, you should not attach too much importance to the present (May, 1932) relatively high prices of the stronger wheats. We may, in a few years time, if the supply of strong wheats be increased, find that the weaker wheats demand fully as much, or even higher, prices than the strong." If such high quality wheats are produced in Australia, they will only be produced in limited quantities at first and their value will afford some guide as to the desirability of their more extensive production.

There is another consideration which should make Australian strong flour white wheats more valuable than similar Canadian red wheat, and that

is the greater value of white bran in comparison with red. In judging the feeding value for his stock, the Irish farmer discriminates between red and white bran to such an extent that he pays up to £2 per ton more for white than for red bran. Moreover, the higher flour yield and lower moisture content of such Australian wheat in comparison with wheat of other countries should make it of greater comparative value.

Grading Necessary.

The next question to determine is how Australian strong flour wheat could be marketed to advantage and, more especially, with benefit to the grower. We still have our f.a.q. system of selling our export wheat. It is possible that, but for this commercial domination of the farmers' interests, it would have been realised before now by British millers and bakers that all Australian wheat is not weak. But it is certain that if the efforts of Australian wheat breeders and growers of strong flour wheats are to be rewarded, the f.a.q. system of selling Australian wheat will have to be changed. At the present time, what little wheat of good strength is produced is mixed with weak flour wheat and thus loses any advantage it should have in price. Dr. Kent Jones refers to our abominable f.a.q. method of selling wheat as our "bugbear," and Sir Albert Humphries states: "Really strong Australian wheats should be kept separate and sold separately; the buyer should know what he is buying. If they could be grouped in strong and weak groups, each would find its own market and be used for different purposes. To mix them would merely confuse the buyer who would pay the lowest price possible."

In a recent letter to the senior author, Dr. Kent-Jones states that there is a possibility of British buyers paying a premium for better quality Australian wheats if we could grade our wheats even to guarantee certain protein contents. With the wheats at present grown commercially in New South Wales, we can probably guarantee 13 to 14 per cent. protein for large parcels of grain produced under dry western or northern conditions, but as long as the f.a.q. system continues the hope of a premium for such wheat is out of the question. Farmers in the dry western wheat belt, where high protein is associated with lower yields, are therefore apparently being unduly penalised by the f.a.q. system of marketing Australian wheat.

It may not be possible to state quite definitely that Australia can grow and market strong flour wheats to advantage abroad, but it seems that a limited production of such wheat will eventually win its way to recognition and to a price advantage in the export market, if our blundering f.a.q. system of marketing is replaced by a grading system or by the separate marketing of such wheat.

Possible Extent of Improvement.

But before wheat of high quality can be produced in sufficient quantity for export, it is probable that it will have to be produced in sufficient quantity to meet local requirements. In common with the world-wide trend, the

Australian baker is also evincing in recent years a great interest in improved wheat quality. Australian millers who usually purchase their wheat direct from farmers, have constantly refused to give any premium for strong flour wheat and it is only within very recent years, since local bakers have been demanding some improvement in flour, that millers have been willing to consider such action. A few country millers have recently been milling separately some medium strong flour wheats produced in certain districts and have found a ready sale for the flour at 10s. to £1 per ton above the price of their average blended flour. Premiums of 3d. to 4d. per bushel are now being offered by these millers to farmers for certain varieties of wheat, such as Pusa 4, Florence, etc., which are of high or moderately high quality. This may not be sufficient to encourage a very wide production of high quality wheats, but it may be the beginning of a more general local recognition of quality which will assist in the general elevation of the flour strength of Australian wheat. It is possible that in the absence of a grading system for the separate marketing of Australian strong flour wheat, such wheat could be purchased by local millers and milled separately for the marketing of a graded flour—Australian strong—with advantage. Canada adopts a similar practice, exporting her strong flour wheat as wheat and her comparatively small volume of weak flour wheat in the form of flour.

While working for the objective of high quality wheat in Australia, Australian wheat breeders must also set out to attain the more immediate objective of improving to some extent the general character of Australian wheat as far as its strength is concerned. Recent dough and baking tests made by the Chemist's Branch of the New South Wales Department of Agriculture have definitely shown that certain popular varieties of wheat produce grain of decidedly low baking quality under certain conditions, such as a cool late wet spring. This low quality is sometimes even further accentuated by bleaching of the grain with rain on the ripened crop. Such wheat requires a lot of support by strong flour wheat to make a blend of flour which will be satisfactory for baking, and when strong flour wheat is in relatively short supply, the weak wheat is still further depressed in value. Many varieties of Australian wheat come into this category, viz., Aussie, Bobin, Caliph, Duri, Gallipoli, Nabawa, Penny, Rajah, Sultan, Turvey, Waratah, Yandilla King, etc., some of which are very widely grown.

Some of these wheats have become very popular in Australia in recent years, and this has probably been responsible for the recent downward trend in the quality of Australian wheat, which has been observed by qualified authorities in England. When these wheats are produced in a dry district, they are not objectionable, but when grown under cool moist ripening conditions they are so soft as to be unsuitable for blending into a flour for bread-making, except in limited quantities. It would seem desirable when such wheats are grown under cool moist conditions that they should be diverted into local mills for separate milling into a special grade of low protein flour, which is demanded by biscuit manufacturers and by a section of the Eastern trade.

Since wheats of very satisfactory quality for bread-baking purposes cannot be produced in the tableland and cooler districts, it seems preferable to breed weak flour wheats especially for these regions and to divert these for use as suggested.

The Department's Wheat Breeding Policy.

This is the policy which is now being adopted by the Plant Breeding Branch of the New South Wales Department of Agriculture. Soft late-maturing wheats of low gluten quality, which naturally tend to be the highest yielding types in the somewhat limited tableland areas and cooler districts in New South Wales, will be specially bred for these districts, from which local biscuit manufacturers, etc., can draw more suitable supplies than they get at present. For the remainder of the wheat belt a general improvement in quality is being aimed at, and there are already distinct indications in New South Wales that a moderate improvement can be accomplished without any loss in yielding capacity. There is the additional objective of reaching the highest quality compatible with yield and other desirable characters, especially for the more western and north-western portion of the wheat belt in New South Wales, where conditions are more favourable for the development of high-protein or strong flour wheat.

Although the above programme is outlined as an objective in wheat breeding in New South Wales, the economic return to the grower will always be the foremost consideration. Sir Albert Humphries thus sums up the question of improving the quality of wheat in Australia:—"The over-riding consideration, to my mind, is the economic results, that is to say, the return which the producer obtains; and whatever the quality of the wheat may be, I would make it subservient to the commercial interests of the producer."

Flour Acquisition Act to be Continued.

The Minister for Agriculture (Hon. H. Main, M.L.A.), has intimated that, while the existing Flour Acquisition Act terminates on the 31st December next, it is the intention of the Government to bring forward amending legislation which will provide for the continuance of the Act during the year 1933.

Moisture Requirements of the Wheat Crop.

To produce a crop of 15 bushels per acre, 4½ inches of water are required to pass through the crop; for every additional 5 bushels, 1½ inches are required, so that 6 inches of rain must actually pass through a crop in order to produce 20 bushels. This by no means signifies that only 6 inches of rain must fall during the growing period, because out of an actual fall of 6 inches during six months 3 inches or more may be lost through evaporation or other causes

Hay Straddles.

L. JUDD, H.D.A., Manager, Temora Experiment Farm.

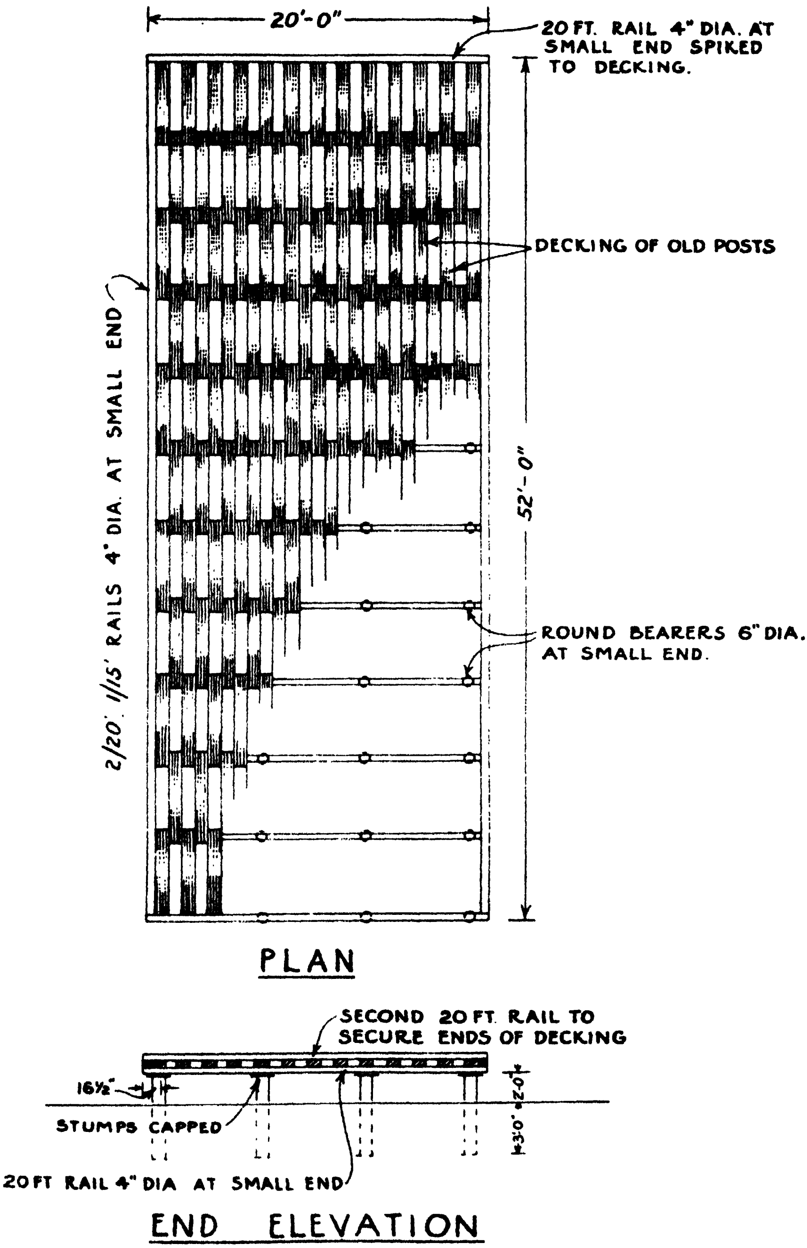
Of the many devices and suggestions that have been put forward from time to time to cope with mice by preventing their entering haystacks, perhaps none offers a greater degree of security, taking into account cost, than a well-constructed hay straddle.

With the following particulars and the accompanying plan to guide him, any handyman should be able to construct an efficient haystack straddle.

EITHER round timber or split posts can be used for the construction of a hay straddle. The dimensions vary according to the tonnage it is required to support. A straddle 20 feet wide by 52 feet long will hold about 80 tons. For the average stack a good size is 15 feet by 40 or 45 feet; a straddle of less than 15 feet in width is not recommended. With the larger straddle (the one 20 feet wide) four posts in line are used, these being spaced 5 feet 9 inches apart, and there are eleven rows of these, the rows being 5 feet apart and the posts 3 feet in the ground. A rail, 4 to 6 inches at small end and 20 feet long, runs right across the four posts, joining them together and supporting the decking, and projecting at the ends 1 foot 4½ inches. Each line of posts is secured in this manner. These are in turn strapped lengthwise by a rail running along each side of the straddle and projecting approximately 1 foot at each end. After the decking has been laid, a further rail joins the side rails at each end. This acts as a support to the side rails and at the same time holds the end of the decking securely in position.

For decking, old disused posts are used, and are laid so that spaces are left between them. These spaces are about as wide as a post, and are left so that when the posts are being laid on the next section the ends may fit into the spaces. The whole is then covered with wire netting. This netting has several uses, acting as a safety device to prevent the worker falling through the interspaces whilst stacking; it also prevents the sheaves and loose straws protruding through and hanging down, which would enable mice to gain access to the stack. The wire netting is best secured at the sides by weaving No. 8 fencing wire through the double of same and then nailing in position. This makes a stronger and neater job.

In a smaller stack (15 feet wide) either three or four posts may be used in a row. If posts are available, the use of four posts is strongly recommended. In cases where only three posts are used, they should be spaced 5 feet 9 inches apart and a greater overhang given to the decking, while a slightly bigger rail should be used to connect the posts. All posts should be placed 2 feet in the ground.



Plan and Elevation of Hay Straddle.

MATERIALS for a Straddle 52 feet by 20 feet.

44 posts, ironbark, 9 ins. x 6 ins. x 5 ft. 4 ins.
11 rails, ironbark, 4 to 6 inches at small end and 21 feet long.
2 ,, ,, 4 ,, ,, ,, 21 ,, ,,
4 ,, ,, 4 ,, ,, ,, 16 ,, ,,
2 ,, ,, 4 ,, ,, ,, 20 ,, ,,
36 old posts, 6 ft. 6 ins. x 7 ins. x 4 ins.
144 ,, ,, 6 ft. x 7 ins. x 4 ins.
44 iron spikes to spike rails to posts.
Supply of No. 8 wire to tie side rails and thread through netting.
5½ sheets of plain iron 20 gauge (6 ft. x 3 ft.).
If rails of the lengths specified are not available shorter lengths may be worked in.

Method of Erection.

Lay out the straddle, being careful to get a right angle at corners, and put in a peg to mark the position each post is to occupy. Sink the holes and erect the outside posts. With straight-edge and level place a mark or drive a nail in at one corner post, and follow round with the level, driving a nail in at the correct level mark on all posts. By stretching a line from outside post to outside post, the centre posts can be readily placed in position, leaving an inch to be sawn off. The idea of leaving the piece to be sawn off is that a better seating is obtained for the cross rail. The idea of adjusting the post to a line to avoid sawing off invariably results in dirt having to be put in the hole to raise the post, and then when the weight is placed on the straddle the post sinks, making the structure uneven. Adze posts to size 5 inches x 5 inches at top before erection, and notch rails so that they seat nicely on to posts and secure maximum hold.

Having lined up and sawn off all posts, they are then capped with plain iron, using a nail or clout to hold the caps in position. In cutting the flat iron, take the sheet and halve it lengthwise and mark with a carpenter's pencil, then divide crosswise with lines 18 inches apart. This gives eight sections 18 inches x 18 inches, which is a suitable cover for the posts. To cut the iron, lay it on a plank of timber and cut it with an old axe and heavy hammer. This method will be found the most satisfactory to adopt. Having adjusted the caps in position, the rails are then placed across the posts and spiked in position, after having been notched at each post. These rails are then notched to take the side rails, which are securely tied with No. 8 wire. The decking is placed in position following this. Taking the first section, posts are laid across, leaving spaces in between to take the tops of the posts from the next section. This makes a far stronger job than butting the posts on the rail, as each post has a full bearing on the rail at both ends. When the decking is laid, the rails at the ends are laid over the decking posts at each end, securing them, and are then tied to the projecting side rails. All ends of rails projecting are neatly sawn off and the netting stretched over the straddle and securely fastened in position. Paint or tar all saw cuts to prevent the timber from splitting.

Particular care must be exercised at all times not to leave ladders, pitchforks, etc., leaning against the stack or allow straw to hang down, as these enable mice or rats to gain entry to the stack.

Pasture Improvement on the Murrumbidgee Irrigation Area.

ESTABLISHMENT, CARE AND MANAGEMENT OF SOWN PASTURES.

J. N. WHITTET, H.D.A., Agrostologist, and H. J. DARGIN, Agricultural Instructor.

A PASTURE consisting of a suitable balance of grasses to clovers not only proves most palatable to stock, but, in addition, supplies the animals with a balanced ration, and whether they are large stock, wethers or lambs being fattened for the market, or milking cows in high production, this type of pasturage produces the greatest returns for the least cost.

Most of the stock raised on the Murrumbidgee Irrigation Area at the present time are grazed on natural pastures, fodder crops, lucerne, etc. The natural pastures consist mainly of herbage, which is seasonal in growth, the dominant plants being trefoils, crowfoot, and barley grass, all of which provide ample feed in favourable winter and early spring seasons. The summer pasturage is deficient, however, except where such plants as paspalum or lucerne have been established or where spear or corkscrew grasses (*Stipa* spp.) are plentiful.

Failures by settlers in the past to establish permanent pastures under irrigation conditions can usually be traced to faulty laying out of the fields, sowing at wrong periods, insufficient drainage, and poor management of the pastures, rather than to the unsuitability of the grasses and clovers used. It is important, however, that the right types of pasture plants be sown, and settlers are strongly advised to use the mixtures herein recommended, and not to employ the unnecessarily heavy and costly seedings which are often suggested by some vendors of seed.

During recent years the Department has carried out a large number of trials with many new species of pasture plants, in addition to the older and better-known species, and as a result of these tests has eliminated those grasses and clovers which have proved unsuitable for the Murrumbidgee Irrigation Area.

Clean Land an Essential to Success.

Weeds, particularly those producing a large leaf surface close to the ground, *e.g.*, cape weed, crowd out large quantities of grass and clover seedling growth, and consequently it is advisable to have the areas intended for sowing as free as possible of these troublesome plants. By ploughing under, or satisfactorily cultivating out, the young growth of cape weed, etc., during the winter, as a commencement in preparing the land for sowing the following autumn, the plants will be prevented from seeding and cleaner pastures will result.

Sheep, and to a lesser degree cattle, will eat the fruiting buds out of the centres of cape weed, and on young, sown pastures, if the infestation of the weed is heavy, the animals should be utilised to control its growth.

Preparation of the Soil.

Although the soils on the Irrigation Area vary greatly, the majority of them are of a fine texture or heavy nature, and not free working. Thorough preparation of the seed-bed is therefore essential. An early-ploughed fallow is recommended, with the subsequent workings aimed at destroying weed growth and securing a fine, firm seed-bed ready for sowing by the last week in February or the first week in March. Compactness without crustation of the surface is necessary in the seed-bed to ensure a satisfactory germination, and the use of the roller or other type of soil packer on light soils or those not liable to cake may be advisable prior to sowing. Where these implements are not available a light smoother or light grader is often used to firm the surface soil.

Grading should be completed in good time to allow the land to be irrigated (if the rainfall is insufficient to promote a rapid germination of the seed) and lightly worked, if necessary, with a tine cultivator followed by a smoother or light harrow to level the surface prior to sowing. The contour of the land to a great extent governs the amount of grading and levelling required, as well as the spacing of the checkbanks, which must be so constructed as to enable quick and thorough watering, coupled with effectual drainage. Checkbanks should run the same way as the fall of the land, not across the fall in any way, and should be not more than 9 yards apart; any effort to force water over high portions of bays is likely to cause scalding of the plants on the lower places during hot weather. The strongest growth of pastures under irrigation is invariably to be found on the checkbanks, and areas already laid down indicate that considerably more feed and better water control is obtained with checkbanks spaced approximately 7 yards apart, this being particularly the case where land has a slight side fall.

To enable rapid and effective watering to be given, which is most essential on hot days to minimise scalding out of plants, the bays should be not more than 4 to 5 chains in length, and where the land has only a slight fall, short bays from 2 to 3 chains in length are necessary.

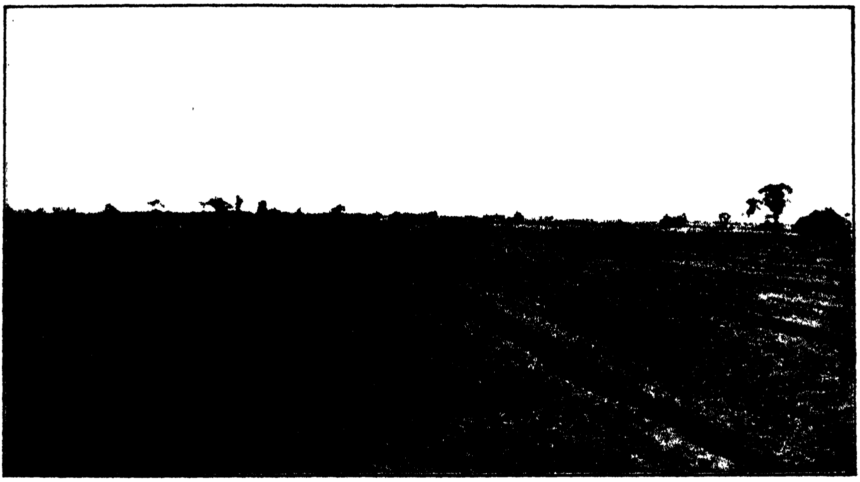
The practice of constructing checkbanks with a plough is not recommended, as the furrow left all round the bays carries the water to the bottom ends too quickly, and uneven watering results; furthermore, there is danger of the water lying in the furrows and destroying the plants. Excellent banks of sufficient height to control a shallow depth of water on pastures can be constructed with the grader or smoother. The road grader is particularly useful for constructing checkbanks.

Time and Method of Sowing.

On the Irrigation Area the time of sowing is largely governed by the water regulations. The time must be fixed sufficiently early to allow of

several irrigations being given the stand after germination and before the water is turned off. Sowing during the last week in February or early in March is recommended. With an early sowing the young plants make rapid headway and respond very well to irrigations given during the warm weather, thus resulting in the early establishment of the plants and early grazings being obtained.

The seed can be distributed by mixing it with superphosphate, using 112 lb. of the fertiliser per acre and sowing through the manure box of the wheat drill or combine. A pasture top-dressing machine of the "dropper" type can be used if a drill is not available, the grass and clover seed being mixed with the fertiliser as recommended in the case of the drill.



Land Well Prepared and Ready for Sowing.

Shallow sowing is necessary where the drill or combine is used; the tubes should be removed from the machine, the seed thus being broadcasted. A narrow board, or piece of flat iron, set at an angle towards the back of the drill or combine, should be fixed directly under the fertiliser box, with the object of broadcasting the seed and preventing it falling into drills or against the discs of a disc drill, which also tend to guide it into rows. Broadcasting gives the plants more room to develop than would be the case where seedlings are crowded together in drills, and also reduces the amount of bare patches and weed infestation.

To ensure that the seed is evenly distributed over the paddock, the various types of pasture plant seed to be sown should be thoroughly mixed. It is also very important that the mixture of fertiliser and seed be kept stirred in the fertiliser box during the process of planting, so as to guard against a patchy germination. The fertiliser box should not be more than half full, so as to facilitate thorough stirring of seed and fertiliser.

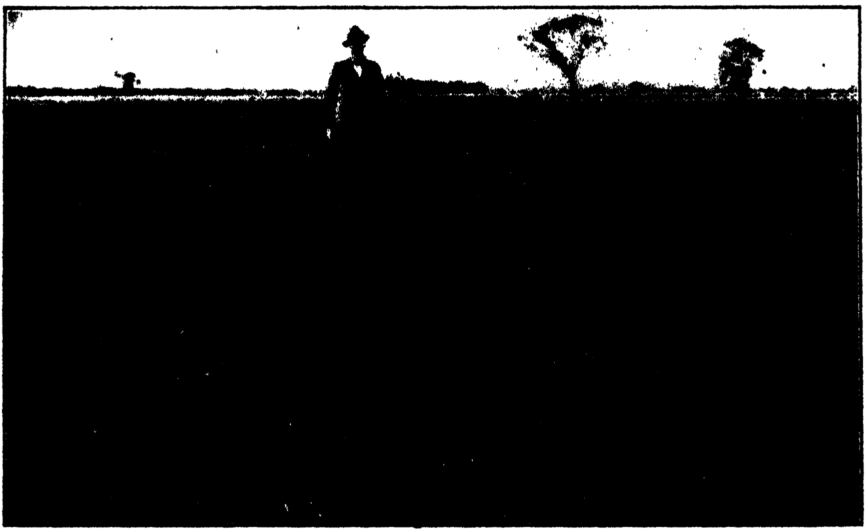
The seed should be properly, but lightly, covered. Do not cultivate the soil into deep furrows before planting, but sow on a flat surface. If the

land is furrowed by the cultivator tines the seed will drop into these drills. Heavy harrows, if used to cover the seed, tend to drag it into drills and also bury it too deeply.

A drag chain, or piece of wire netting 6 feet long, running the width of the wheat drill or combine, gives effective covering to the seed. The netting bent to shape and pulled by one horse can afterwards be used to cover the seeds on checkbanks by dragging it along the top of each checkbank.

After-treatment, Irrigation, and Management.

The establishment of areas of permanent pastures entails considerable outlay in the preparation of the soil, grading, seed, fertiliser and watering, and it is necessary to maintain these pastures in a highly productive



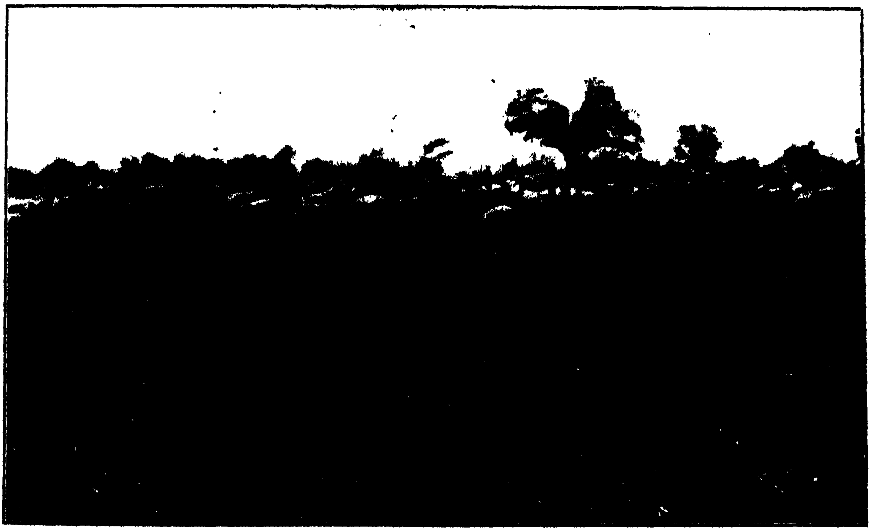
A Pasture Rapidly Established and Showing Effective Winter Growth as the Result of Early March Sowing.

state and carry large numbers of stock on them to recoup the expenditure. With efficient management, pasture improvement should form the basis of an extremely profitable stock-raising industry on the Area, and sown pastures should form the first step in the raising of fat lambs or in dairying.

As previously stated, sowing should be completed early enough to enable watering to be carried out after germination. Ideal subsequent treatment consists of regular waterings at intervals of about from three to four weeks, when necessary, during the winter period to maintain growth, but the watering regulations at the present time do not permit of this. In normal years the winter rainfall should be sufficient to carry the plants through until watering can be resumed in the spring, but in dry winters watering will be essential to preserve the stand.

It should be possible to commence light grazing about two and a half to three months after sowing, using a large number of stock for a short period and not allowing them to graze the areas too closely. As the plants develop, the grazing periods may be prolonged, but should always be regulated. Irrigated pastures should be rotationally grazed, small paddocks being established with this object. Stock can then be moved round every few days, so as to ensure a continuous supply of nutritious grazing, high carrying capacity, and long life of the pastures. Small paddocks prevent animals from roaming over the area, and so food wastage from tramping is minimised.

As the supply of irrigation water is generally cut off about the end of April, it is therefore imperative that the pastures be given a good soaking just prior to this period, particularly if the season is dry. As soon as



Portion of the Pasture Trial Conducted with Mr. F. J. Blackmore, Farm 938, Leeton.

water is available in the spring regular irrigations should be commenced, when required, and carried out every two weeks (approximately), 2½ to 3 inches of water being applied per irrigation. After each watering, or after rain, the ground should be allowed to become firm before stock are pastured, otherwise many plants will be killed by the tramping.

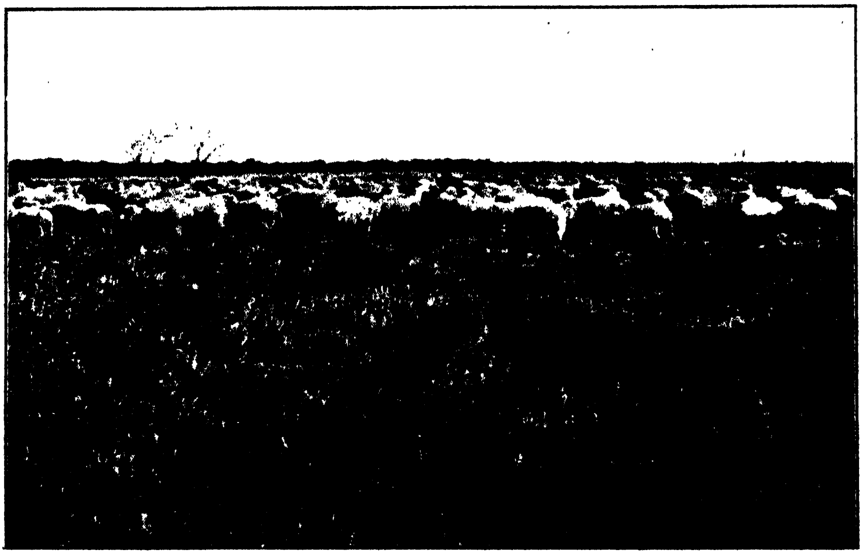
In summer months, irrigation water travelling over the hot land attains a high temperature by the time it reaches the lower end of a bay, and scalding of the plants may result. It will, therefore, be readily realised that comparatively short bays, rapid watering and efficient drainage are necessary to minimise this trouble.

Regular cultivation with special pasture harrows is recommended for all closely-grazed pastures and should be a regular practice under irrigation

conditions. A number of the soils on the Area set hard, and if grazed while wet a very hard uneven surface results.

Pastures of the type of paspalum, kikuyu or Rhodes grass, which generally become badly sod-bound, should be given a good cultivation in the autumn with an implement such as a paspalum cultivator or a rigid-tine cultivator fitted with lucerne points. All pastures should be harrowed with pasture harrows whenever required, to break up droppings and keep the surface stirred.

Top-dressing is necessary to maintain the fertility of closely-grazed pastures and must become part of the routine. Two hundredweights of superphosphate per acre per annum is recommended for pastures of this



Sheep Grazing on the Pasture Trial on the Farm of Mr. G. Blacker, at Yanco.

nature, 1 cwt. to be applied in March and 1 cwt. in October. Occasional dressings of 1 cwt. of sulphate of ammonia per acre can be given to some of the paddocks to stimulate growth at particular periods when urgently needed.

The March application of superphosphate is required to produce extra growth during winter months. Before applying any fertiliser, the pasture should be well eaten down and then harrowed to open up the surface soil. Harrow again after the fertiliser is applied in order to work it into the land.

With the system of management outlined above, pastures can be kept in a highly productive state, though the lack of water during the winter months will affect the continuity of the grazing. The majority of the plants used in the grass mixtures recommended are perennials and valuable winter growers, and with regular waterings during the winter months

would make excellent growth. Dependence on the natural rainfall during the winter in normal seasons, with an occasional watering during a particularly dry season to keep the plants alive, will certainly limit the utility and returns which should be obtained from these pastures.

Pasture Mixtures Recommended for Irrigable Areas.

(A) *Mixture for Permanent Pasture.*—Perennial rye grass (certified seed), 8 lb., cocksfoot (Akaroa) 4 lb., paspalum 2 lb., Italian rye grass 1 lb., Wimmera rye grass 1 lb., white clover (certified seed) 2 lb., perennial red clover 1 lb., Alsike clover 1 lb., subterranean clover ½ lb., sheep's burnet ½ lb., and lucerne 1 lb. per acre; total of 22 lb. seed per acre.

If it is desired to omit paspalum, because it is already plentiful on the land or in the supply channels, head ditches, etc., perennial rye grass (certified seed) 2 lb., can be added to this mixture in lieu of paspalum seed. The latter is certain to become established amongst the sown pasturage later, as paspalum is plentiful along the banks of most of the supply channels on the Area.

(B) *Mixture for Temporary Pasture.*—Italian rye grass 6 lb., perennial red clover, 4 lb., berseem clover 2 lb.; total of 12 lb. seed per acre.

This mixture contains rapid growing plants which will provide quick growth for grazing purposes and make a suitable two-year rotation crop after growing maize, wheat, rice, etc. The berseem clover will only last one season, but the perennial red clover and some of the Italian rye grass will persist for two to three years.

This mixture could be used to advantage on land too shallow for lucerne, and in addition to providing grazing it will also produce good quality, palatable meadow hay.

(C) *Mixture of Annuals where Water is Expensive.*—On parts of the Murrumbidgee and other irrigation areas where water has to be pumped the cost of waterings is expensive, and therefore only a limited amount of water can be profitably used. The mixture to sow under these conditions is Wimmera rye grass 3 lb. and subterranean clover 3 lb. per acre.

Irrigation of this type of pasture should commence in the last week of February to germinate the seed of these two annual plants; another watering will be required in March and one each month during August and September, the natural rainfall being depended on to produce and maintain growth during the winter months. If the pasture made good growth during September and October, dry feed would be available when these annual plants dried off after seeding in November.

(D) *Plants for Wet Situations.*—Strawberry clover (*Trifolium fragiferum*) will do well where damp conditions prevail throughout the year. Seed of this plant is expensive (8s. to 10s. per lb.), and consequently the use of ½ lb. seed per acre, scattering a few seeds here and there in damp spots, is recommended. Under these conditions the seed germinates readily and the plants will spread rapidly. When strawberry clover is well established, roots or runners of some of the plants can be divided up for transplanting into other areas instead of purchasing more seed.

Pure Seed Areas.

The development of superior strains of the species of pasture plants which are showing most promise under irrigation is being undertaken, and a number of pure seed areas of grasses have been established on the Murrumbidgee Irrigation Area.

Seed that is expensive, as is the case with Toowoomba canary grass (*Phalaris tuberosa*), should be sown as a pure seed block from which seed can be harvested for sowing additional areas on the holding, and any surplus material marketed. Four pounds of good quality seed of *Phalaris tuberosa* are sufficient to sow an acre. Good grazing will be obtained from the pasturage produced during the periods when the area is not closed for seed-saving purposes.

Carrying Capacity of Irrigated Pastures.

The following stocking records are from areas sown in the autumn of 1931 with mixtures including perennial, Italian and Wimmera rye grasses, cocksfoot, paspalum, and white, perennial red, alsike and subterranean clovers.

The winter of 1931 was exceptionally wet for this locality, 13.74 inches of rain falling during the months March to July inclusive. The average annual rainfall at Leeton for the past fourteen years is 16.61 inches. The experiment areas were soaked with water for three months, and in most cases it was impossible to stock the paddocks effectively until the latter part of August or early September. By this time the feed was very matted and much of it was wasted through tramping. It was impossible to work a mowing machine on the paddocks on account of their damp condition and the tangled growth of pasturage present.

The average carrying capacity, as shown in the following table, is calculated on the actual grazing recorded to 30th June, 1932:—

TABLE Showing Carrying Capacity of Improved Pastures.

Trial.	Experimenter.	Area.	Date of Sowing.	Grazing Period.	Average Carrying Capacity for 12-months' Period.
		acres.	1931.		sheep per acre.
A	C. E. Spencer, Farm 1456, Murrami.	10	30 Mar....	12-8-31 to 30-6-32	5·7
B	G. E. Blacker, Farm 1533, Yanco.	13½	6 April...	1-9-31 to 30-6-32	6·0
C	C. W. Pike, Farm 1697, South Gogeldrie.	8	20 April...	1-7-31 to 30-6-32	6·7
D	F. J. Blackmore, Farm 938, Leeton.	10	9 April...	2-9-31 to 30-6-32	*8·2

* Mixed stock, dairy cows and sheep grazed, result calculated as sheep-grazing days.

Included in each of the trials A, B and D was an area of 3 acres of a summer pasture mixture, which, owing to faulty germination, provided very little grazing during this twelve-months period.

The dry period in May, 1932—rainfall 48 points and no irrigation water available—considerably affected the carrying capacity for the months of May and June. In December, 1931, the pasturage on trial A was eaten out by grasshoppers and a large proportion of the grass and clover was killed. This infestation considerably reduced the effectiveness of the sward and subsequent carrying capacity.

Rainfall at Leeton.

The monthly totals for the period 1st July, 1931, to 30th June, 1932, were as follows:—

	Points.		Points.
1931—July	94	1932—January	...
August	43	February	84
September	117	March	174
October	75	April	279
November	188	May	48
December	14	June	164
		Total	12·80 in.

Dry Area Pastures.

In addition to irrigated pastures, much improvement in the carrying capacity of dry area pastures can be obtained by establishing suitable plants such as lucerne and Wimmera rye, giant panic and Rhodes grasses. The land should be fallowed and well prepared, and the seed sown as soon as possible after rain in the autumn. A light seeding of these plants, particularly lucerne, is recommended, heavy seedings usually resulting in spindly plants which are unable to withstand dry conditions. Areas of these pastures are much heavier carrying and more drought resistant than the natural pastures, and are valuable to use in conjunction with the irrigated areas.

Sow in the autumn on fallowed land: Wimmera rye grass 2 lb., Rhodes grass 1 lb., giant panic 1 lb., lucerne 2 lb.; a total of 6 lb. seed per acre. If giant panic is unprocurable, add an extra pound of Rhodes grass to the mixture.

Seed Supplies.

The quantities recommended in this publication are based on the use of good quality seed, and intending purchasers are recommended to ask our advice regarding the best sources of seed supplies. If necessary the Department will carry out germination and purity tests of pasture plant seeds for landholders free of cost.

Sown Pastures in the Bathurst District.

Reporting on the results of pasture improvement trials carried out on Mr. E. Ashworth's farm at Raglan, Mr. T. Mau, Assistant Agrostologist at Bathurst Experiment Farm, emphasises the suitability of lucerne and *Phalaris tuberosa* in pasture mixtures on the light granitic loams of this district.

These trials were commenced in April, 1929, when a 12½-acre paddock was subdivided and sown to the following mixtures:—(1) Lucerne 2 lb., Wimmera rye grass 1 lb., and *Phalaris tuberosa* 1 lb. per acre; (2) lucerne 2 lb. and Wimmera rye grass 2 lb. per acre; (3) lucerne 1 lb., tall fescue 2 lb., tall oat grass 2 lb., and subterranean clover 1 lb.; and (4) lucerne 3 lb. and perennial red clover 1½ lb. per acre. These mixtures were chosen with a view to economy, the idea being to establish a good pasture as cheaply as possible. Although 1 cwt. of superphosphate per acre was sown along with the seed, payable results would probably have been obtained from the use of half that amount.

Since the grasses became established in 1929 the area has been stocked sometimes at the rate of three sheep per acre (up till June, 1930), and for the past year at the rate of two and a quarter sheep per acre. The carrying capacity of the natural pasture is one sheep per acre. Furthermore, the supply of feed on the sown area has been more constant than on the unimproved areas.

The lucerne-Wimmera rye grass-*Phalaris tuberosa* mixture has given most promise. The lucerne produces excellent feed during the warmer months, while *Phalaris tuberosa* has been outstanding, giving fair pickings right throughout the summer, even during the two dry summer months of last year. It has also grown vigorously during the winter months, producing excellent grazing when other plants gave very little. It has stood up to constant stocking very well. Wimmera rye grass has also proved a valuable grass in the district, although it has not done so well during the past year. Generally, however, it provides a large amount of feed during the winter and spring months, when other sources of feed are rather scarce.

Good Results with Sorghum in the Cobargo District.

Mr. John L. Green, Agricultural Instructor on the far south coast, holds out excellent prospects for the growing of fodder sorghums on the poorer hill country in the Cobargo district. The point is also made that sorghum is hardier than maize. About 4 or 5 acres of sorghum in a fair season, Mr. Green points out, will fill a pit silo with sufficient silage to feed a herd of thirty cows on a full ration for a period of four months.

Mr. H. F. Sawtell, "Narira," Cobargo, co-operated with the Department in carrying out a sorghum variety trial last season. The plot was sown on 15th October with a wheat drill in rows 28 inches apart, 9 lb. seed and 1 cwt. of superphosphate per acre being used. Harvesting took place on 11th May last, the yields per acre being:—Sumac, 10 tons; Saccaline 7 tons 2 cwt.; White African, 5 tons 5 cwt.; and Oxley, 2 tons 19 cwt.

Although Sumac yielded best last season it cannot be recommended in preference to Saccaline and White African, which long experience and previous trials have shown to be superior yielders to Sumac.

Grass and Clover Seed Production.

POSSIBILITIES OF THE INDUSTRY IN NEW SOUTH WALES.

[Continued from page 639.]

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

In the first half of this article, which appeared in our previous issue, Mr. Moodie gave some idea of what the establishing of the pasture seed production industry would mean to New South Wales, not only from a financial point of view, but from the point of view of ensuring better seed. The principal grass seeds we now import and which could with advantage be grown in this country were also dealt with individually and in some detail.

In this concluding section, Mr. Moodie deals with the establishing and management of seed-producing areas and makes some suggestions concerning the marketing of the crop.

Establishing Grasses for Seed Production.

THE land selected should be easily worked and free from obstructions which would prevent the use of the mower or other harvesting machinery. The soil should be well prepared and a fine, firm seed-bed formed, free from weeds. Well-worked fallow on which weeds have been eliminated by cultivation as they appeared is recommended.

Sowing should be carried out in the autumn at the rates of seeding recommended in last month's article, when dealing with individual grasses, and using 1 to 2 cwt. superphosphate per acre. Grazing may be commenced as soon as sufficient growth has been made, and, as with ordinary pastures, the grazing periods should be short and well regulated. Heavier stocking will be necessary in the spring, as it is not desirable to allow the crop to form seed during the first season, particularly in the case of perennial rye grass. If seeding cannot be controlled by grazing, the mower should be used.

During the summer and in the following autumn and winter, ordinary grazing should be carried out, and then the paddocks closed up for seed production in the early spring. Before closing up the areas for seeding, a top-dressing with sulphate of ammonia (1 cwt. per acre) will increase the yield of seed and assist the grass to combat weed growth. A seed crop should be available every year after the first. Cocksfoot should never be grazed very short, as this grass will not stand such close grazing as perennial rye grass, and seed production and the life of the stand will be adversely affected by continuous grazing.

The areas for seed production will benefit by the use of pasture harrows after each grazing period if big stock are used, or every few months in the case of sheep. Top-dressing at the rate of 1 to 2 cwt. superphosphate per acre in the autumn is also beneficial.

To produce clean seed particular attention must at all times be paid to weed growth, especially to tall-growing species. Keeping the pastures in good growing condition by proper management and fertilising will assist to this end.

In estimating the net returns from the seed crop, the life of the stand should be taken into account and the initial cost of establishment spread over that period, and not all charged against one year's returns as would be done in the case of an annual crop.

Handling the Seed Crop.

After cutting by hand or with the mower or reaper and binder, the material is raked into windrows and cocked or made into stooks, as the case may be, then allowed to dry; after which it is stacked in the field for threshing, or carted to the barn.

Threshing may be done by hand if the quantity is small, the material being then sieved and "winded." With proper care, a fair sample can be prepared in this manner, but the work is slow. A grain thresher with special blast and sieves is far more satisfactory and turns out a good "farmer's dressed sample." A special thresher is necessary for this work, or a harvester rigged up as a stationary thresher may be used. The seed may then require winnowing before it is ready for sale. The thoroughness with which the work of keeping the seed areas in good condition and free from weeds and of harvesting and cleaning the seed sample is undertaken, will be largely reflected in the price offered by the purchaser. Farmers' dressed samples will generally require further dressing and re-machining by the seed merchant before being offered for sale.

In the case of clovers, a clover huller is necessary to thresh the seed, but a machine of this nature could be owned co-operatively by a number of farmers. With the establishment of the industry in well-defined areas there is no reason why a group of farmers should not purchase and operate their own cleaning and re-machining plant for all classes of seeds. They could then sell direct to other districts. For the farmer intending to specialise in seed production, the possession of an implement such as the chain drum stripper, obtainable in New Zealand, would be a distinct advantage. With this implement the paddock can be worked over two or three times, as the seed ripens, thus obtaining the maximum yield of well-filled seed. These machines can be used for grasses and clovers, and are suitable for use on stony country where the mower could not be used.

Marketing the Seed.

In any form of production marketing is one of the greatest factors to be considered. With a good product there is little doubt that the pioneers in this new industry could dispose of much of their seed by local sale. With the expansion of the industry it would be necessary to sell to merchants who have to meet certain market requirements. To obtain this business the seed produced must be able to meet the overseas product on the basis

of price and quality, and, in addition, must be available when required. The latter point is important, because the merchant requires his seed supplies each year in ample time for the sowing season. The farmer who harvests his seed, say, in December, and does not thresh and clean until March or April, would have no chance of selling to a merchant who would have dealt with the majority of his orders by that date.

With large areas available for seed production in certain districts there is no doubt the industry would soon reach another stage of development, common in seed-producing countries, in which seed-buying is organised. In this case the representative of the seed dealer or merchant negotiates with the farmer for the purchase of the crop in the field, and may make arrangements for harvesting, cleaning, etc.

It may be said in concluding these brief remarks on marketing that local merchants are quite willing to handle locally produced seed, provided they are assured of regular supplies of good quality seed, which can meet imported seed on an equal basis as to price.

Suggested Organisation of the Industry.

From many points of view it would be advantageous for a seed production industry to be established by units of farmers in fairly definite areas rather than have growers scattered here and there throughout the tablelands and coast. Desirable features of such a method of organisation that come to mind are—

(*a*) Growers would have better control of their industry in dealings with seed purchasers, and could obtain supplies such as fertilisers, bags, etc., co-operatively, with resultant savings in prices and freights.

(*b*) Arrangements for threshing and cleaning seeds could be made with contractors who would not have long distances to travel. This would eliminate the necessity for each farmer to own his own threshing and cleaning plant.

(*c*) A district would, in time, establish a reputation for producing good strains of some particular grass, which would naturally be to its advantage.

(*d*) Inspection of crops by buyers would be facilitated.

(*e*) Where seed production is concentrated in fairly definite areas, strains can be developed suitable to various local conditions. Overseas strains are not selected for our conditions.

Finally, with an appropriate growers' organisation, advertising could be carried out, which, in conjunction with the natural expansion now taking place in pasture improvement work, would create a greater demand for the seed. The fact that seed-producing units were established at various centres would, in itself, act as an example to local landowners to lay down improved pastures.

Seed Certification.

Seed-producing countries have come to realise the value of strain in relation to seeds of pasture plants, and seeds of certified strains naturally command higher prices than inferior lots. It has previously been mentioned that in establishing areas for seed production only certified seed should be sown.

In order to protect growers of good strains, and for the benefit of the industry and those sowing areas of grasses and clovers for grazing, the Department would be willing to consider a scheme of seed certification such as is in operation in New Zealand. Although this would entail a considerable amount of work in inspecting seed areas, providing an officer in attendance during threshing operations to seal the bags, testing strains and carrying out seed analysis, it would be of incalculable benefit to the growers.

With a scheme of seed certification in operation, the industry could be built up steadily on the basis of strain, and the Department is not anxious to encourage it along any other lines.

A Summary of the Main Considerations.

New South Wales can produce excellent seed of lucerne, paspalum, couch and Sudan grass, and small areas of perennial rye and white clover are handled. We have suitable districts and soils, and there is no doubt we could become self-supporting as far as the production of seed of the most important pasture plants are concerned. Apparently, however, we have developed an "import complex" as regards seeds, probably due to the popular idea that because our climatic conditions are not the same as prevail in New Zealand and Europe these seeds cannot be produced here. That this idea is incorrect can easily be proved by observing the prolific seeding of local pastures of perennial rye, cocksfoot, *Phalaris tuberosa* and white and red clovers. It is to be hoped that as farmers become more enlightened as to the use of these grasses and clovers for pasture purposes they will demand locally-grown seed.

For seedsmen to become interested in this matter, and to obtain their support, it is essential that regular supplies should be available every year. This indicates the advisability of growers becoming regular producers so that supplies will be maintained at all times. At present, the majority of our few seed producers are too casual, harvesting when the mood takes them, or when conditions are very favourable. This attitude is inimical to the growers' own interests.

Regular Supplies of Clean Seed Essential.

In connection with regularity of supplies, the question of our variable seasonal conditions is certain to be raised. The wide extent of country and range of conditions under which these seeds can be produced in New South Wales is ample answer to this question. It would be an extraordinarily bad season indeed that would result in the seed crops failing at such widely

divergent centres as, say, Glen Innes, Moss Vale, Taralga, Bombala, Kangaroo Valley and Orange, which are instanced principally because perennial rye grass is naturalised at these centres, and because they are potential seed-producing areas.

The production of seed reasonably free from weed seeds is a matter of importance. Many existing paddocks of old-established perennial rye grass, for example, would be unsuitable for commercial seed production, owing to the presence of weeds and weedy grasses. The seed-grower must realise the necessity for clean seed and keep his seed paddocks as free from weeds as possible. This is not difficult and can be achieved by correct cultivation, fertilising and management. If the sample produced contains a high percentage of weeds, the farmer is faced with the fact that the

An Improved Pasture on the Murrumbidgee Irrigation Area—one of the Districts Suitable for Grass and Clover Seed Production.

product may be unsaleable or only saleable at a reduced price. In this connection the existence of the Agricultural Seeds Act may be mentioned. Although this Act would not apply to the farmer selling seed to a seed merchant for the purpose of being cleaned and sold, it certainly does apply to sales to other farmers, stock and station agents, etc.

Lack of Machinery may be an Obstacle.

Many farmers who should be interested in seed production do not at present possess the requisite plant for this work, and this appears to be the most serious obstacle confronting the farmer embarking on seed production. Australian methods of cereal crop farming are different to those practised in New Zealand and Europe. In the seed-producing areas of those countries many travelling threshing plants operate, and the farmer has no difficulty in making arrangements for this work to be carried out. In New South Wales our grain crops are handled with reaper threshers, etc., and in any case the districts suitable for the production of such seeds as perennial rye grass, cocksfoot and *Phalaris tuberosa* do not, as a rule, produce

cereal crops for grain. There are, therefore, few threshing plants in existence in these areas, and Australian machinery firms, as a general rule, do not produce this type of machine. There is one thresher available, however, which would meet the needs of seed producers, and the cost is about £140. Farmers could well co-operate in the purchase and operation of a machine of this type. In addition, a hay rake will be required. In any case farmers can at least commence this work with a small expenditure for plant, so there can be no serious objections on this score.

Competition should Cause us No Great Concern.

In its infancy a scheme of this nature may be received with scepticism in some quarters and any real or imaginary difficulties magnified. The chief competitor on our own market would be New Zealand, where the economic and living conditions are similar to our own. We, therefore, meet this competition on an equal footing in this respect and it should be possible to establish the industry on a basis of profit to the producer without recourse to tariffs and similar artificial aids. New Zealand harvests between 40,000 and 70,000 acres each year in the production of seed of perennial rye grass, cocksfoot, red clover and white clover. This meets home requirements and a considerable export trade to Australia and other places. It is obvious, therefore, that in New South Wales we have ample country suitable for seed production, at least to meet our own requirements and for export to other States.

As the work of pasture improvement progresses and farmers realise the value of strain in pasture plants, as they do in cattle, wheat or oats, the demand for improved strains will be more insistent. The recognition and isolation of desirable high-producing strains by the agrostologist or plant-breeder will be of little value unless there is a seed industry to take over these strains and produce seed in commercial quantities.

Seed production does not mean the abandoning of present lines of farming by the individual, but can be carried on in conjunction with sheep-raising, dairying, crop-raising or any other of the usual farming activities. It is essential, however, that adequate attention be given to the paddocks for seed production at all times, and that it be made a systematic and methodical activity of the farm.

Conclusion.

In conclusion it can be definitely stated that in New South Wales we have climatic and soil conditions suited to the production of seed of pasture plants. The establishment of a permanent industry depends entirely on the human element. Seed merchants quote many cases of carelessness on the part of local farmers producing seeds such as garden peas. Samples have been submitted which, instead of being pure seed of the variety named, contain many impurities in the shape of other varieties, which could easily have been removed from the crop in the field. After experiences of this kind, the merchant is quite justified in buying on the market offering reliable supplies. However, if local growers of grass and clover seeds will only take the trouble to proceed on the right lines, success should be assured.

Pit Silage on the South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

In the July *Agricultural Gazette* an article by Mr. J. M. Pitt gave detailed instructions regarding the making of silage in pits, particular reference being made to the trench type of pit silo, which is gaining greatly in favour among dairy-farmers on the central North Coast. That South Coast dairy-farmers have also come to realise that the pit silo is a safe and very cheap means of conserving fodder is vouched for by Mr. Makin in the following article. Mr. Makin has refrained from touching on the question of constructing the pits, etc., so fully covered by Mr. Pitt.

Of the methods of fodder conservation practised by the farmer, the making of silage in trench-shaped pits—wherever it is possible to do so—has much to commend it. Where soil conditions are such that the plough and scoop may be used in excavating, this method will be found cheaper than any other, and it is perhaps the most economical as far as the handling of the crops is concerned.

Quite a number of trench silos have been put down on farms in the Camden district and they have been found quite serviceable as means of storing the fodder at a comparatively low cost.

In the shale country little difficulty is experienced in maintaining the structure of the trench, as the walls generally hold well when the trench is empty, but, in other soil formations it may be found necessary to support the walls by boards or concrete. It is not advisable to excavate deeper than 6 feet nor wider than 14 feet, though the trench may extend as far as thought fit. On dairy farms a most convenient size is 12 feet x 6 feet x 60 feet, which would contain about 80 tons. The earth taken from the trench should be conveniently placed equally on both sides, as most of it will be required for covering, and supporting the silage stacked above the surface.

In selecting a site for a trench silo it is advisable to choose a spot on a rise where the drainage is good. This is not easy in some cases, but one should not be deterred on this account, as cases can be cited where farmers have put down silage in trenches in flat country, in cultivation paddocks, and have grown crops over them without any loss being suffered in any way. Again, cases have come under notice where silage has been stored for many years in this way and during the time flood waters have, on several occasions, covered the trenches without any detriment to the fodder.

In a season of heavy crops the trenches may be constructed right alongside the crops or in grazing paddocks adjacent to the cultivation; they can also be located in positions where they will be useful for feeding stock in parts removed from the farm centre.

The chaffing of maize and sorghum crops directly into the trench has much to commend it. The chaffed material will be found to pack better, be easier to handle when getting it out, and be more economical when feeding. On some farms the practice is to place the chaff-cutter about the centre on one side of the trench, and each load of greenstuff, as it is brought in, is put through the cutter by each man as he comes in starting and stopping the engine as required, and spreading the chaffed stuff in the trench, before returning to the cultivation paddock. This practice is fast becoming general.

In filling, the surface of the silage must be kept level from end to end. The scoop must be brought into use to bank the excavated earth up round the silage, which is stacked above the ground level to a height of 4 or 5 feet. The earth should be rounded off with a cap about 18 inches in thickness on top of the silage.

It will be necessary occasionally to go over the surface with a rake and cover in any cracks which may appear in the covering of earth, due to the settling down of the silage. When settlement is complete a scattering of grass seed or oats may be made, and the resultant crop will in some cases stop the washing away of soil from the cap during heavy rain.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ..	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6,200
Swane Bros....	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ..	2,000	3,000	...	...	...	5,000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

—C. G. Savage, Director of Fruit Culture.

Pumpkins and Squashes.

Classification and Description of Varieties.

[Continued from page 690.]

W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeder.

In last month's issue of this *Gazette*, Mr. Darragh described the different varieties of pumpkins (*Cucurbita maxima*). Next in order of importance are the squashes and marrows, which belong to the species *Cucurbita pepo*. These are described and illustrated in the following article.

Part 2.—Squashes and Marrows.

To the species *Cucurbita pepo* belong most of our garden squashes and marrows. As stated in the previous section of this article, this species contains the "pumpkin" varieties of America, but in Australia they are referred to as squashes.

Cucurbita pepo L.—Plants either of the vine or bush type; stems five-sided with distinct ridges and grooves in both bush and running varieties; stems, leaf stalks and leafy blades spiny; leaf blades deeply lobed with three to seven distinct lobes; leaf spots occur occasionally, but are not large nor distinct. Flower stalks obtusely five sided; unopened bud pointed. Corolla tube flaring with lobes pointed; stamens pointed; calyx disc-like; sepals short and fleshy and pointed. Fruit stalk or peduncle five sided and distinctly ridged and grooved, very hard at maturity, often slightly enlarged. Fruit shell very hard at maturity. Seed colour greyish white; margin of seed identical in colour and texture with body of seed. Seed scar rounded and horizontal.

To Distinguish Between *C. pepo* and *C. maxima*.

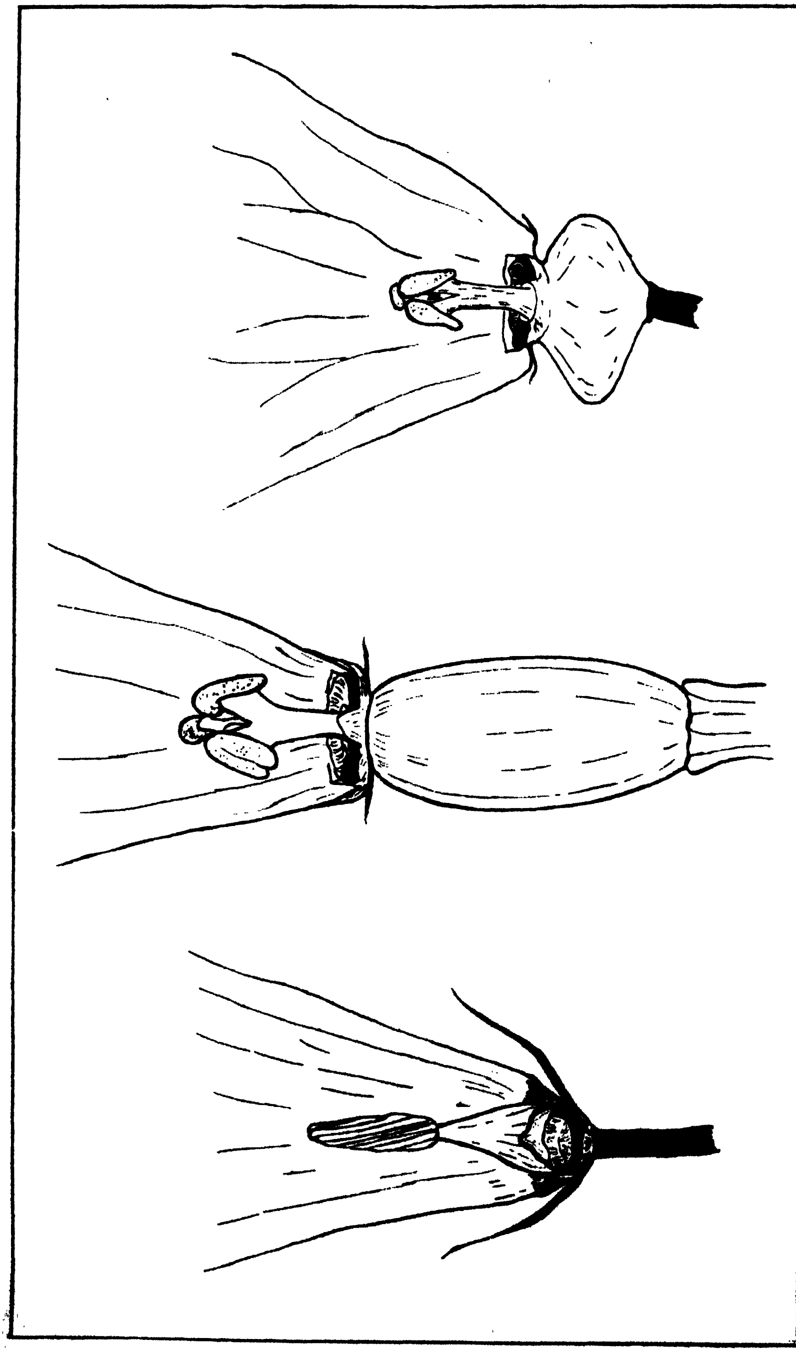
The species *C. pepo* is readily separated from *C. maxima* by its lobed leaves and spiny stems, pointed flower bud, flaring corolla tube with pointed lobes. It is, however, more difficult to separate from *C. moschata*, which is a mixed group and closely approaches *C. pepo* in many respects.

For the purposes of description the species *C. pepo* can be divided into the following groups:—

1. Scallops and bush squashes.
2. Vegetable marrows.
3. Sugar squashes.
4. Fordhook squashes.
5. Crookneck squashes.

Scallops and Bush Squashes.

Scallops and bush squashes are small, round and flattened squashes with scalloped edge. They are mostly white or golden-brown in colour and are borne on bushy plants. These varieties mature early and are often called



Flower Types of Squashes and Marrows.

Left: Section of male flower of *C. pepo* with base of stamen cut away.

Centre: Section of female flower of vegetable marrow.

Right: Section of female flower of scallop squash.

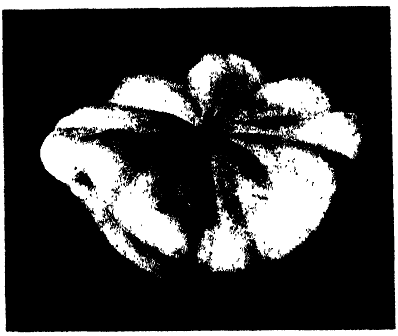
summer squashes in contrast to the late-maturing winter squashes. They should be used as a vegetable before the shell hardens, as the flesh then becomes coarse and bitter.

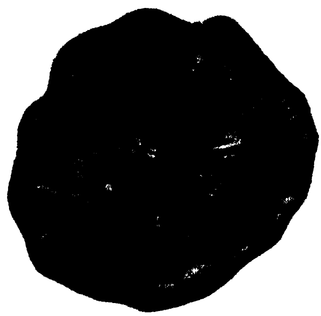
Early White.—A white scallop, averaging in weight 2 to 3 lb.; size, 6 inches by 4 inches; matures very early. Flesh white and medium grained, but becomes coarser on maturity. A prolific bearer. Shell very hard at maturity.

Mammoth White.—See Early White.

Early Golden Bush.—A golden-brown scallop, similar to Early White in size and weight. Flesh cream coloured, medium grained. Not as prolific as the white sorts. Shell hard at maturity. Not a good keeper.

Golden Custard or Custard Squash.—A yellow to golden-brown scallop with hard thin shell. Flesh medium grained, yellowish in colour. Weight, 6 to 7 lb. Size, 11 inches in diameter. Not a prolific bearer.





Scallops and Bush Squashes.

White Scallop. Custard Squash.

Vegetable Marrows.

This group forms a very popular vegetable and is quite common on the market. The plants are bushy or running, and the fruit is long and oblong to cylindrical in shape with a smooth skin. The colour varies from cream or pale golden to green. Some types are white in the young stages, but turn yellow with maturity. Vegetable marrows also should be used as a vegetable before the shell hardens, as the flesh becomes coarse and bitter at maturity.

Rice Marrow.—An orange-coloured marrow, oblong in shape with smooth skin. Weight 7 lb.; size, 12 inches long by 6 inches. Flesh is thin and somewhat coarse. The fruit is quite hollow. Not extensively grown.

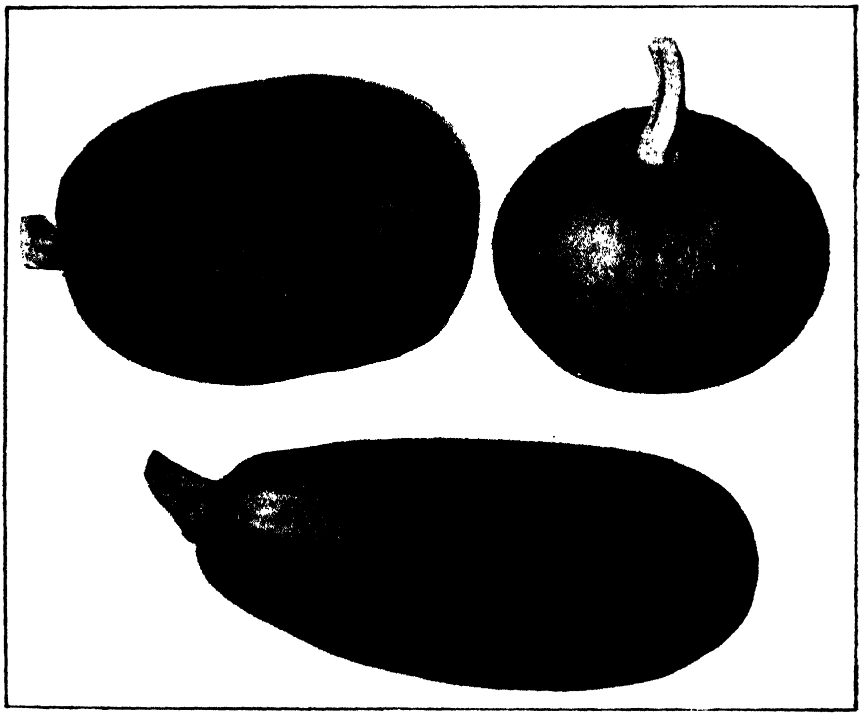
Long Green Bush.—An oblong marrow 10 to 12 inches long by 5 inches, weighing 4 to 6 lb. Skin smooth and green in colour with wide golden stripes. Flesh medium grained, becoming coarser with maturity, white to cream coloured.

Long White Bush.—This variety is one of the most popular, both for market and home garden. Skin white to cream in colour, smooth. Length

11 inches by 5 inches; weight 4 to 5 lb. Flesh medium grained, white in colour. Shell hardens at maturity. Keeps only for a limited time.

Long Creamy Marrow.—Closely resembles Long White Bush and is equally as popular. Oblong in shape and cream coloured. Size 10 inches by 5 inches. Flesh light cream in colour and medium grained. Shell hardens at maturity. Weight 3 to 5 lb. Plants running.

Rotherside Orange.—Not extensively grown. Oblong in shape with smooth yellow skin. Size 7 inches by 5 inches. Weight 5 lb. Flesh thin, cream coloured and medium to coarse grained. Fruit is of the hollow type.



Vegetable Marrows.
Top Left: Rice Marrow. *Top Right*: Rotherside Orange.
Bottom: Long White Bush.

Cocozelle Bush.—More or less cylindrical in shape. Size 8 to 10 inches; weight 3 lb. Colour orange and green. Flesh medium grained and white in colour. A typical marrow.

Moore's Cream.—Small round marrow, yellow in colour. Size 5 inches; weight 2 lb. Flesh medium grained, yellowish in colour. Not extensively grown.

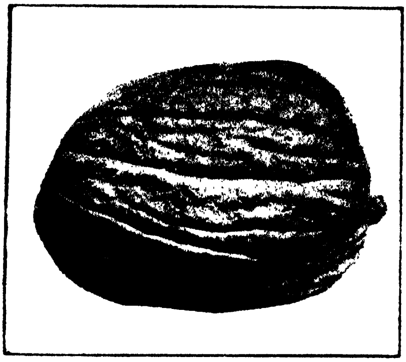
Pen-y-byd.—Similar to Moore's Cream, short oblong in shape, smooth skin yellow in colour. Weight 1 to 1½ lb. Flesh medium grained and yellow in colour. Not grown extensively.

Sugar Squashes.

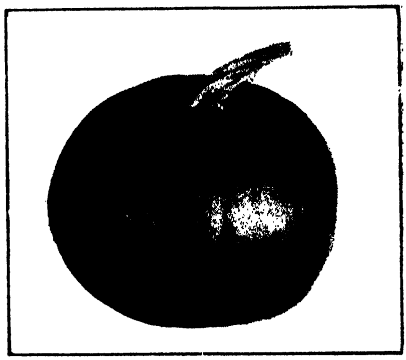
Vines with running habit; fruit round with flattened ends, light-brown to orange-red in colour. Surface slightly grooved and ribbed. Shell very hard at maturity. Fruits have large seed cavity and are inclined to be hollow.

Mammoth Tours.—Fruit oblong in shape; size 14 inches by 13 inches; weight 20 lb. Fruit very hollow and mottled brown to green in colour. Flesh coarse grained and of deep cream colour.

Connecticut Field.—Orange-yellow coloured fruit with grooved surface, though not deeply so. Shell thin and hard. Fruit large and often growing to 20 lb. in weight. Flesh coarse and yellow in colour. Not grown extensively.



Mammoth Tours



Connecticut Field.

Sugar Squashes.

Small Sugar.—Shape globular but flattened on ends; size 6 inches by 6 inches; weight 4 lb.; ribbed surface; skin yellow. Shell hard. Flesh medium grained, and yellow in colour.

Winter Luxury.—This variety resembles Small Sugar in shape, but is golden-yellow in colour. Fruit is grooved; size 6 inches by 6 inches; weight 3 to 5 lb. Flesh coarse grained and yellow in colour.

Fordhook Squashes.

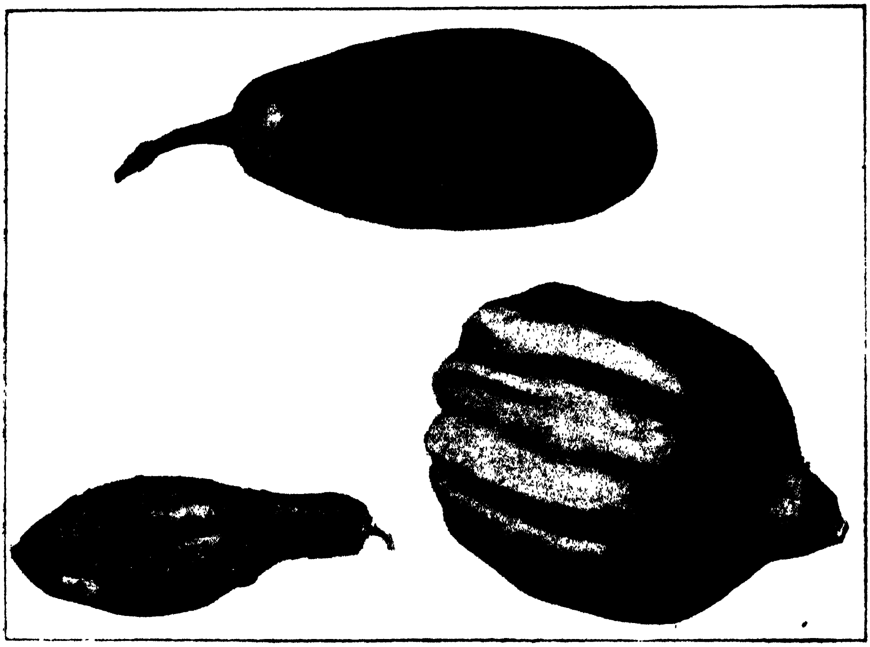
This group contains both bush and running types. The fruit is small and has distinct grooves and ridges, and is more or less elongate in shape. The varieties are not as popular as they should be. The variety Fordhook is an excellent home garden type, and should be grown on a larger scale by market gardeners, as it is very prolific. An important variety in this group is the variety Table Queen, recently introduced from U.S.A.

Fordhook.—An excellent variety and should be grown more extensively. Small in size (about 6 inches long) and slightly tapered; cream coloured; weight 1 lb. Flesh fine grained, sweet and cream coloured. Vines running, but not robust. A very prolific bearer.

Bush Fordhook.—Fruit closely resembling the Fordhook variety, but plants are of bush type.

Delicata.—This variety has a characteristic colouration, being cream at the stem end and green at the blossom end of the fruit. The line of demarcation between the two colours is very clearly defined. Shape is elongate cylindrical, slightly groved and ribbed. Size 6 inches long; weight 1 to 2 lb. Flesh medium grained and yellowish in colour.

Table Queen.—An excellent squash, introduced by the Department of Agriculture from U.S.A. The fruit is small, slightly elongate at the blossom end and distinctly grooved. Size 6 inches by 4 inches; weight 2 lb. The skin is smooth and dark green. Shell thin and hard. The flesh is fine grained and deep yellow colour. The variety is an excellent keeper and cooker. It should be grown more extensively both ir market and home gardens.



Fordhook and Crookneck Squashes.
Top: Fordhook.
Bottom Left: Yellow Crookneck. *Bottom Right*: Table Queen.

Crookneck Squashes.

These are bushy plants with golden or white fruits. The fruit has a long curved neck and is much warted. The crookneck squashes are early-maturing sorts and must be used before the shell hardens. Not extensively grown.

Yellow Crookneck.—Yellow fruit, small in size, with crooked neck. Surface is much grooved and strongly warted. Weight 2 lb. Shell very hard at maturity. Flesh medium grained and cream coloured. Not grown extensively.

(*To be continued.*)

Tobacco Notes for October.

C. J. TREGENNA, Tobacco Expert.

OCTOBER is a slack month for the tobacco grower, apart from the fact, of course, that it is very necessary to give every attention to the young growing seedlings in the frames. The next job will be the transplanting of the seedlings into the field, but that should not be undertaken before November.

Thorough Preparation of the Soil.

As tobacco should start to mature in two to two and a half months after transplanting, growers should realise the wisdom of giving careful attention to the preparation of his ground. With anything like unfavourable soil conditions the rapid and healthy development of the plants is bound to be interfered with, and it should be the concern of the grower to do all within his power to prevent such a state of affairs.

The area intended for planting should have received a thorough ploughing early in the winter, followed by cultivations as frequently as required to keep weed growth from exhausting the soil of moisture. These cultivations also tend to sweeten the soil, and put it into a proper tilth by the time transplanting takes place.

Shortly before the season for transplanting, *i.e.*, some time during this present month, the land should be given a second ploughing to a depth of about 9 inches, and then harrowed. This treatment puts the soil in such a condition that the rootlets of the tobacco plants are hampered as little as possible in their search for nourishment.

Hardening-off the Seedlings.

It is very important that the young plants in the seed frames be hardened off prior to transplanting into the field. In about a month from time of sowing, the seed beds should be ready to be uncovered.

This hardening-off process should be done gradually. For the first few days, if the weather is very hot, cover up the seed beds in the middle of the day until the plants can stand the direct heat of the sun.

Keep Insect Pests in Check.

A sharp lookout should be kept for the appearance of insect pests in the seed beds, as a comparatively few insects may destroy a whole bed of young plants and necessitate wholesale re-sowing.

Outworms are among the most serious offenders in this respect, but the brown vegetable weevil and the tobacco stem borer may also cause severe damage. The use of poisoned bait, made as follows, has been found invaluable in controlling cutworms:—Paris green, 1 lb.; bran, 24 lb.; water, 3 gallons; salt, 4 oz. Treacle (20 oz.) can be used in lieu of the 4 oz. salt,

while the addition of some finely-chopped lemons to the water when mixing the mash renders the bait more attractive to the cutworms. In the seed beds the bait should be scattered lightly, as the beds are frequently watered, and where excessive quantities of bait are used the Paris green from it may be washed down on to the delicate roots and kill the young plants.

The most effective control for the brown vegetable weevil is to dust the infested plants with calcium arsenate powder. Where the area is large the calcium arsenate powder may be diluted with ten times its weight of hydrated lime. Lead arsenate may also be used, at the rate of 1 lb. powder to 30 gallons water, and will give effective control. Dusting the plants with lead arsenate mixed with an equal weight of hydrated lime may be employed as an alternative method. Another useful method, particularly when the plants attacked are small or are in the seed beds, is to dip the tops of cape weed, potato, or other food plants that can be easily obtained in a lead arsenate or calcium arsenate solution, or dust them with the diluted powder after dipping them in water, and place them between the rows of infested plants. This is best done towards evening, as the treated tops remain fresh and attractive over-night when the beetles are feeding. Clean cultivation is also a factor in control of this pest in the field.

The tobacco stem borer (better known as the potato moth) lays its eggs on the shoots and stems of the tobacco plant. On hatching, the young caterpillars tunnel their way into the stems and bases of the leaf stalks, where they feed and undergo their development. When fully fed they enter their pupal or resting stage within small cavities in the stems, and later emerge as adult moths.

Spraying or dusting the plants, either in the seed bed or the field, with arsenate of lead will control the pest. The spray should be made by mixing 1 lb. arsenate of lead powder with 40 gallons water, or the dust by mixing 1 lb. arsenate of lead with 3 lb. hydrated lime, or in equal parts if the infestation is severe.

Clean cultivation is also a factor in the control of the pest. All rejected and waste tobacco plants and the remains of potato or tomato plants, after these crops have been harvested, should be cleared up and burnt, so that any moths emerging from the drying tobacco stalks have little suitable food upon which to lay their eggs. If allowed to remain the material provides excellent breeding grounds for the pest.

Infectious Diseases Reported in August.

The following outbreaks of the more important infectious diseases were reported during the month of August, 1932:—

Anthrax	Nil.
Blackleg	5
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	1
Swine fever	Nil.
Contagious pneumonia	4
Necrotic enteritis	Nil.

—Max Henry, Chief Veterinary Surgeon.

Yanco Rice Crop Competition, 1931-32.

H. J. DARGIN, Agricultural Instructor.

THE seventh annual rice crop competition held under the auspices of the Yanco Irrigation Area Agricultural Society for the cup donated by the Rice Millers' Association attracted eighteen entries—one of which was withdrawn.

From the time of the commencement of rice growing on a commercial scale (eight years ago) until the 1930-1931 season, when 35 per cent. of the total area was sown on land which had grown one or more rice crops previously, there was no appreciable shortage of new land, but during the past season (1931-1932) the figures were reversed, and 65 per cent. of the area sown had grown rice previously. As it was realised that it was practically impossible for entries grown on land producing a second or third rice crop (consecutive or otherwise) to compete with any degree of success with crops grown on either virgin land or land producing its first rice crop, the scale of points was amended to that shown in this report. The objective was to encourage entries from those men who practised the most successful methods of growing rice on land which had previously grown the crop, so that other growers might benefit from their experience.

The Season.

During 1931 record wet winter seasonal conditions prevailed, with the result that rice-growers experienced considerable difficulty in the early preparation of their land for the 1931-1932 season's rice crop owing to the moist and in some instances unworkable condition of the land, as well as the rampant weed growth which naturally resulted from such a wet season.

Up till 24th December, from which date the weather became hot, conditions were cool and changeable, and proved altogether unsatisfactory for the growth of young rice plants. This was particularly noticeable on some of the grey soils, or those of heavy texture, which had been watered to obtain a germination just prior to one of the cold snaps which occurred during the months of September, October, and November. During January the temperature was over the 100 degrees mark for eleven out of twelve days—the average temperature being the highest ever recorded for this month at the Leeton Observatory. February, March, and April, with high temperatures and humidity above the average for each of those months, were ideal for the growing of rice crops, while fine weather continued practically throughout May, and enabled the harvesting operations to be carried out in a very satisfactory manner. Several widely scattered hailstorms passed over the Area between 1st and 17th April, but fortunately,

no very serious individual losses were sustained. As far as could be ascertained some forty crops were affected, the damage resulting being up to three bags per acre on the affected bays.

Despite the cool changes experienced during the first few months of the growing period, the majority of crops stooled well, grew large, well-filled heads, and matured evenly. Throughout this end of the Area the paddy produced this year is an excellent sample of grain, which should meet with the approval of millers and all concerned in the rice industry in Australia.

The Winning Crops.

Mr. H. L. Tooth's winning entry was grown on grey clay loam which ha produced three crops of rice and one crop of wheat (1930) during tl four years. The bays were sown with a drill on 25th October at th ie p. 130 lb. of seed and 130 lb. of sulphate of ammonia per acre, an ne rate of obtain a germination a few days later. Immediately aft nd watered to struck total submergence was carried out. A further er the grain had of sulphate of ammonia per acre was made to the pplication of 1 cwt. in January. The check banks were large and strong, a rowing crop held water on the bays to a depth of at least 8 inches. Owing to the su essf ul methods of weed control adopted the crop was particularly clean, dense and uniform for third-year land, was in good condition, had large, well-filled heads, and was estimated to yield 160 bushels per acre.

The entry placed second was grown by Mr. A. D. Malcolm, of Farm No. 1039, Murrami, on a red loam of light texture, and was sown early in October at the rate of 130 lb. of seed per acre; approximately half the area was manured with sulphate of ammonia at the rate of 150 lb. per acre when drilling the seed early in October. The bays were watered to obtain a germination on 10th October. This land had grown two crops of ri previously, and was heavily infested with barnyard grass seeds. Immediat the rice struck all plant growth on the bays was submerged and the bay kept in that condition until eventually the rice plants grew above the water. With the exception of a few small patches, the barnyard grasses failed to survive this method of weed control. The land had been fallowed since January, was ploughed a second time in September, and then well worked. Strong check banks had been erected which enabled water to be held on the bays to a depth of at least 8 inches, and sheep were run on the banks during the growing stage, which kept the weed growth down. This crop, which was also estimated to yield 160 bushels per acre, had large heads, well filled with excellent grain: it was in good condition, but barely as uniform as the winning entry.

Mr. Malcolm also grew the crop which occupied third place in the competition. It was estimated to yield 150 bushels per acre, and was grown on red loam of somewhat heavier texture than the other entry, and on which rice had been grown once previously—during the 1929-1930 season. Sowing at the rate of 125 lb. per acre was carried out during late September, and the bags were watered on 10th October; no manure was used. The land w

known to possess barnyard grasses in abundance, and similar methods of weed control were adopted as with the other entry, with the same excellent results.

AWARDS in Yanco Rice Growing Competition, 1931–32.
(All entries were of the variety Caloro.)

Competitor.	Preparation of Land. (Max. 10 points.)	Water control, check banks, ditches, etc. (Max. 40 points.)	Freedom from Weeds. 1st crop. (Max. 10 points.)	2nd crop. (Max. 40 points.)	3rd and subsequent crops (Max. 50 points.)	Condition and uniformity of crop. (Max. 25 points.)	Apparent yield. (One point for every 10 bushels of estimated yield.)	Total points awarded.
H. L. Tooth, Farm 1081, Murrami	7	36	...	...	39	20	16	118
A. D. Malcolm, Farm 1039, Murrami	8	34	...	...	39	19	16	116
Do do do ...	7	32	...	34	...	21	15	109
H. J. T. Gorey, Farm 474, Murrami	8	36	9	...	...	24	21	98
R. St. C. Young, Farm 1684, Yanco	7	33	...	27	...	17	13½	97½
A. D. Mackellar, Farm 790, Gogeldrie	6	31	...	28	...	16	12	93
D. J. Coote, Farm 1690, Gogeldrie	7	35	9	...	...	23	17½	91½
A. D. Mackellar, Farm 790, Gogeldrie	7	36	7	...	...	21	16	87
R. G. Griffiths, Farm 500, Murrami	7	32	8	...	...	22	17	86
A. W. Asmus, Farm 1110, Whitton	7	34	7	...	...	20	17	85
L. Male, Farm 192, Leeton ...	7	35	7	...	...	21	14	84
R. St. C. Young, Farm 1684, Yanco	7	33	8	...	...	19	16	83
C. G. S. Fraser, Farm 1698, Gogeldrie	6	35	8	...	...	19	15	83
R. G. Griffiths, Farm 501, Murrami	7	35	7	...	...	18	15	82
W. R. Cater, Farm 1696, Gogeldrie	7	33	8	...	...	19	14½	81½
W. S. Martin, Farm 983, Gogeldrie	6	35	8	...	...	19	13½	81½
H. G. Lodge, Farm 1450, Murrami	6	34	8	...	...	19	14½	81½

General Comment.

As has been the case in past years, most of the best crops were found growing on the properties of farmers who prepared their fields in a satisfactory manner. Where the land had been well graded, suitable seed-beds prepared, and large check banks constructed to allow of deep submergence early in the season as well as even water control throughout the growing period, the weed growth was invariably found to have been satisfactorily controlled, the rice matured more evenly, while heavy yielding crops resulted.

Despite the periodical cool changes experienced during the early part of the season, and a certain amount of damage which resulted from the attention paid the young crops by ducks, which were present in greater numbers than in previous years, the crops finished up well, and the estimated average yield of the seventeen entries was 155 bushels per acre, which compares very favourably with previous competitions.

Weed Control.

On some properties weed growth proved a considerably more difficult problem to cope with than the moisture in the soil during the winter of 1931, owing to the root system of the plants preventing satisfactory ploughing and grading of the rice bays. Consequently, as the season drew on the growers with such land were reluctantly compelled to sow in bays which were in an undesirable condition. Owing to these circumstances some settlers even found it necessary to prepare a different portion of their properties to that already designed and intended for this season's rice crop. In a few years' time, when a rotation of crops in conjunction with rice growing is being more generally adopted, such a move may be impossible. The grading of land intended for rice, a season or two prior to actually sowing the crop, should therefore be worthy of some consideration more especially as wet weather conditions prolong the harvesting operations over such a lengthy period that some rice-growers have found themselves still harvesting rice when under normal conditions they would have been occupied in preparing land for the next rice crop.

In most of the entries the bays were particularly clean and free from barnyard grasses and cumbungi, but in a number of instances altogether too much weed growth was found on the check banks, and of a type which it is advisable to prevent growing and seeding on the rice fields, such as cumbungi (*Typha latifolia*), barnyard grasses (*Echinochlia crus-galli* and *Panicum colonum*), stick weed (*Aster dumosus*), Bathurst burr, and several of the sedges and rushes.

During the past couple of years those growers who have adopted the recommended methods—either sowing rice on the strip of land on which the check banks are erected during late September and October, or broadcasting rice seed on the banks prior to the last trip both ways with the delver—have practically done away with the weed growth, which under ordinary conditions would have made its appearance on the banks.

There is no doubt that with adequate draining and a sufficiently strong check banking system that will hold a considerable depth of water on the bays—sufficient to cover completely the young barnyard plants—this weed can be successfully controlled. During the past few years a number of growers have adopted with great success the method of sowing when the soil had warmed up, watering once only, and draining off to germinate the rice, and then, when the whole of the rice plants appeared to have struck, totally submerging the bays, keeping the water at least 3 inches above all plant growth. The rice plants make more rapid growth than the barnyard

grasses, which gradually die out, while the rice plants in a short while appear above the water. From this stage onwards the usual methods of even water control until the full depth of submergence has been reached is followed. Messrs. H. L. Tooth's and A. D. Malcolm's entries in this competition, which were grown on third year and second year land respectively, and were placed first, second, and third in this year's competition, were outstanding examples of the results that can be obtained by adopting this method of weed control.

Now that most of the available rice land has grown this cereal on one or more occasions, many of the growers realise that if weed growth is to be satisfactorily controlled every care must be taken to obtain a successful germination of rice at the first attempt, without having to resow in parts of the bays. Such matters as the type of soil on which the crop is to be grown, as well as the prevailing seasonal conditions, now play a big part in the final preparation of the seed-beds and sowing periods. To obtain the best results sowings should be made at a period of the season when the soil temperatures of any particular types of land would lead one to expect a quick and successful germination of rice seed, so that early submergence may be carried out. Without hot or warm weather during September and October, the grey or dark soils remain cold for a longer period than the red soils, most of which are of a lighter or more open texture. During the past season a number of settlers found it necessary to resow grey soils on which rice had failed to germinate on account of the sowings having been made too early or before the land had warmed up sufficiently.

The seeds of barnyard grasses have repeatedly proved to be more hardy than rice seed, and the necessity for a somewhat fine and smooth seed-bed, in which a shallow sowing of rice can be made so as to enable the plants to strike and get away quickly, is obvious if weed growth is to be overcome.

Seeding.

During the past season the rate of seeding on new land varied considerably more than in previous years, ranging from 100 to 150lb. per acre. This was possibly due to the fact that some settlers had reason to doubt the quality of their seed. On second and third year rice land the quantities ranged from 100 to 130 lb. per acre. In the past the recommended quantities of seed for new land have been 100 to 110 lb. per acre, and up to 130 lb. per acre for older land. At the present time I cannot see any reason for altering these rates, provided, of course, that a good class of seed is used and suitable weather conditions prevail for germination.

There are a number of conditions which govern the rate of seeding, and these should be kept in mind, so that when circumstances warrant heavier seeding growers may make the necessary adjustment. There is always a percentage of seed which does not strike, but the quantity is greater when the seed has not been graded or is not of the best quality, when the seed-bed is not in good order, when barnyard grass is prolific, or where a soil of

fine texture has to be sown and watered a little too early in the season—prior to it having warmed up sufficiently. Sowings heavier than about one bag to the acre do not appear to be necessary under any circumstances, except, of course, when resowing becomes necessary.

Some growers still show a tendency to keep rejected, unmarketable, or otherwise inferior grain for seed purposes, while a few settlers persist in sowing grain harvested from crops in which red rice is present. Both these practices are to be discouraged, for if persisted in, monetary loss and inconvenience will result in a very short while.

No Loss of Moisture by Capillarity in our Dry-farming Areas.

For many years it has been the opinion of agricultural scientists and experts that a loose, dry soil-mulch was effective in preventing loss of moisture from the soil, by checking the rise of the soil moisture to the surface. It was held that water was capable of rising in the soil by capillary action and thus reaching the surface, where it was evaporated unless prevented by means of a mulch, but research in recent years tends to show that the upward capilarry movement of soil moisture is effective only over short distances, and it is only when the ground-water level is within about 6 feet of the soil surface that moisture can rise to the surface.

Under dry farming conditions there is consequently no loss by capillarity, and therefore a soil mulch in itself is of no value in checking the loss of soil moisture. This fact, however, does not materially reduce the importance of the cultivation of the fallow, as it prevents loss of moisture through weeds, which are great robbers of soil moisture. Furthermore, the maintenance of a loose, coarse, granular mulch will allow rains which fall during the spring and summer to sink into the soil readily, instead of running off or being held near the surface to be rapidly evaporated.

There are other benefits to be derived from the cultivation of the fallow apart from conservation of moisture. For instance, the aeration of the soil promotes the development of soil bacteria, which results in increased production of nitrates, and, moreover, one of the chief advantages of a cultivated fallow is the preparation of a good seed bed, which ensures a ready germination and vigorous early growth of the crop. As a result of the compacting of the seed-bed the amount of moisture per unit volume of soil is increased, with the result that the young roots of the crop can obtain the moisture more easily.—H. C. Stening, Chief Instructor of Agriculture.

A Crow Trap that is Effective.

"I received your Department's pamphlet telling how to build a crow trap," writes a Capertee farmer, "and erected it last Saturday. By Monday midday it had nine crows in it."

Copies of this leaflet ("An Effective Crow Trap") will be supplied free on application to any farmer in New South Wales.

FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

Departmental herds include the following Stud Bulls :—

Guernsey : HOPEFUL OF WOLLONGBAR (499), Champion, R. A. Show, Sydney, 1928. *Ayrshire :* SCOTTISH PRIDE OF GOWRIE PARK (3797), First and Champion, R. A. Show, Sydney, 1927; First and Reserve Champion, R. A. Show, Sydney, 1928. *Milking Shorthorn :* MORNING STAR OF DARBALARA (Vol 8), Second, R. A. Show, Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522.5 lb. milk, 1,614.1 lb. butter fat in 365 days. *Jersey :* FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

The Department has for sale young bulls from tested dams of the following breeds :—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

Application should be made to—THE UNDER SECRETARY, Department of Agriculture, SYDNEY

Are We Producing the Right Type of Rice?

In his recent book on the East Indies, Mr. Ambrose Pratt seriously criticises Australia for growing rice varieties which have no export value. He states that in the course of the centuries of rice cultivation innumerable varieties of rice have been produced, and amongst a vast majority of Oriental peoples there has long been firmly established a demand for the harder types of rice, which they prefer to any other. The Eastern peoples, especially the Chinese, unless forced by circumstances, will not use or eat the softer grains, and their cultivation in the East has long since been practically abandoned. The advice is given that Australia should abandon the cultivation of the grain at present produced in the Commonwealth and grow only the varieties which have yielded the best results in Siam.

On the establishment of the Plant Breeding Branch of this Department in 1927, one of that Branch's first actions was to introduce varieties of rice from practically every rice-growing country in the world, with the object of securing those of the best yield and quality for local conditions or for breeding purposes. Amongst others, samples were obtained from the Federated Malay States and these were thoroughly tested in the breeding plots at Yanco. The result was most disappointing, as none of these rices even came into head by the time the varieties already in use were ripe. The same fate has befallen the varieties which were brought back from Siam by Mr. Pratt in 1930.

A very exhaustive series of tests, made with several hundred varieties and many different types of rice from practically every rice-growing country throughout the world, has established the fact that for the present the Murrumbidgee Irrigation Area must grow the short-grained, soft, Japanese types of rice represented by the varieties Caloro and Colusa, which have proved far more successful from the standpoint of yield than any other varieties or types. In common with other temperate countries such as California, China, Italy and Spain, New South Wales is compelled to grow these early-maturing productive varieties and cannot produce the Patna type nor the Carolina (southern U.S.A.) type, which is of later maturity, although of superior quality.

The comparatively soft Australian rice of the Murrumbidgee Irrigation Area has now mostly fitted into Australian requirements since it has been recognised by the housewife that it requires a much briefer cooking period than the harder-grained Patna rice which she formerly used.

It is well recognised by the Department, however, that for export purposes the harder, long-grained type of rice brings a higher price on the world's markets. As a matter of fact, it is not the Patna or the Siamese rice, but the Carolina rice of southern U.S.A. which is most highly valued in world trade. Intensive tests and observations made by the Department's Plant Breeder at Yanco (Mr. Poggendorff) show that the best of these Carolina types are still somewhat too late maturing and not sufficiently productive for the Murrumbidgee Irrigation Area, though there are indications that some earlier selections may prove useful. Still greater success, however, is expected from the evolution of new varieties by cross breeding, which will combine the earliness and productiveness of the Caloro and Colusa varieties with the excellent grain qualities of the Carolina type. Very promising headway in this field of work is now being made by the Department.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—	
Funk's Yellow Dent	Mr. J. A. L. Thompson, Deepwater, South Gundagai.
Large Goldmine ...	Messrs. P. Short and Sons, "Moore Park," Armidale.
Sorghum—	
White African ...	Manager, Experiment Farm, Grafton.
	Manager, Wollongbar Experiment Farm, Lismore.
Tomatoes—	
Bonny Best ...	Manager, Experiment Farm, Bathurst.
Improved Sunnybrook Earliana ...	Mr. Albert Sorby, Macquarie Fields.
Marglobe	Mr. S. A. Spicer, "Billabong," Lewis Ponds
	Manager, Experiment Farm, Bathurst.
Asparagus—	
Connover's Colossal	Mr. H. Eastwood, Tascott, *via* Woy Woy.
Lady Washington	Manager, Experiment Farm, Bathurst.
Water-melon—	
Angelino	Mr. C. J. Rowcliff, Old Dubbo road, Dubbo.
Grey Monarch ...	Mr. A. McKim, Bolwarra.
	Mr. T. J. Offner, "Mount Olive," Dubbo.
Cucumber—	
Early Fortune ...	Mr. E. Money, Terrigal.
Pumpkin—	
Banana ("Banana Squash")	Mr. F. J. Offner, "Mount Olive," Dubbo.
Queensland Blue	Mr. P. Morandini, Bunglegumbie Road, Dubbo.
Grass—	
Perennial Rye Grass ...	Mr. C. Watson, Pyree, *via* Nowra.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Chenopodium carinatum.

("Crested Goosefoot" or "Boggabri.")

POISONOUS TO STOCK UNDER CERTAIN CIRCUMSTANCES.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

THIS is a common weed, and in central coastal areas and many parts of the country west of the coastal range, both slopes and plains, grows commonly and is extensively eaten by sheep.

In 1918 it was found by Smith and White in Queensland to be cyanogenetic, and that New South Wales plants might also be cyanogenetic was found on examination of plants growing at the Veterinary Research Station, Glenfield; this fact being confirmed by Mr. Finnemore.

As it was known that this plant was commonly eaten by stock it was felt that most samples of the plant must contain so little glucoside that the resulting HCN would be insufficient to poison sheep. Nevertheless it was realised that the cyanogenetic content might vary, and therefore a number of plants were collected by inspectors of stock in various parts of the country for chemical examination. This showed a large number to be cyanogenetic, but as quantitative analyses were not undertaken it was not possible to say just how dangerous the plant might be. A lookout was kept for mortality attributable to the plant, but no such losses were met with until comparatively recently.

In February of this year, Inspector Ellis reported that an owner in the southern Riverina lost eighteen out of 800 weaners which had been suddenly transferred to a paddock in which there was a prolific growth of the weed, no other green feed being available, and the circumstances attending the mortality suggested cyanogenetic poisoning. Specimens of the plant were forwarded to Glenfield Veterinary Research Station, when they were found to be cyanogenetic, and chemical examination by Mr. Finnemore showed them to yield HCN in such quantity (0.024 per cent.) that stock eating them might be poisoned.

The plant has been sent in from the following districts, cyanogenetic plants being received from those in italics:—Bathurst, Canonba, *Coonabarabran*, *Coonamble*, *Corowa*, *Cumberland*, *Deniliquin*, *Dubbo*, Forbes, *Mudgee*, *Narrabri*, *Tamworth*, *Urana*, *Wagga*, *Walgett*, *Warialda*. In addition to these districts the plant has been seen by the author in many other parts of the western slopes, west and south, and I should think it occurs in all these districts.

Like other cyanogenetic plants, such as *Euphorbia Drummondii* (milk weed) and *Cynodon incompletus* (blue couch), *Chenopodium carinatum* would seem to be most dangerous for stock which are travelling and hungry

or which are transferred to a paddock where there is a profusion of it, the stock not previously having had access to it in any quantity. So far, cattle do not seem to have suffered.

The plant is known to many sheep owners, and a point which assists in its recognition is the fact that when bruised in the hands it has a strong aromatic smell (sometimes referred to as unpleasant).

Dwindling of Bees Rather Prevalent This Winter.

A Cardiff beekeeper complained recently that his bees were dying from some obscure disease. Dead and dying bees were found around about the entrance to the hive and others were found dead some 50 yards away, apparently having died in flight. The trouble was diagnosed by Mr. W. A. Goodacre, the Department's Senior Apiary Instructor, as a form of dwindling that was rather prevalent this winter in some parts of the State, particularly where the honey was gathered during damp weather, thus making it difficult for the bees to process it properly. The moisture causes the honey, particularly if left unsealed, to ferment and the bees in endeavouring to restore it to its correct standard contract severe digestive troubles, which are often fatal.

This dwindling does not often result in losses of whole colonies, although the hives of bees may be considerably weakened. Given favourable weather the colonies usually overcome the trouble in a few weeks.

To alleviate the trouble it is advisable to remove any supers in excess of the requirements of the bees. It is often the honey stored above where the bees are active that is neglected and allowed to absorb excessive moisture. Any colonies severely affected should be re-queened at the first favourable opportunity.

Australia Exports More Produce to the United Kingdom.

The change which has taken place in the buying habits of the British public and the growth of the demand for Empire goods are clearly brought out in the recently published Annual Report of the Empire Marketing Board for 1931-32. For twenty-five Empire products, new records in quantities of imports have been established, and for more than half of these the record now surpassed was made in the previous year. This indicates that there is an upward tendency at work, in spite of the diminished buying power of the public.

Australian produce has set up no less than eight of the twenty-five new records. More Australian wheat, flour, frozen lamb, frozen pork, butter, eggs, sugar, and pears were imported into the United Kingdom than ever before. Frozen pork, eggs, and pears had set up record high levels in 1930, but these were surpassed in 1931. Australian beef reached the highest level in any year since 1925, and the shipments of frozen rabbits were the largest since 1925. Although imports of Australian wine fell considerably short of the quantity imported in 1927, a new record was established by the quantity entered for home consumption, which reached 2,391,000 gallons.

Dairying Notes.

Palatable Rations for Dairy Cows.

THE selection of palatable fodders in the preparation of a balanced ration is an important aspect of milk production. Variety is also a distinctly valuable factor in feeding, but it is essential that any change in food comprising a ration should be carried out gradually. Most dairymen have noticed that when certain fodders are first fed to dairy cows they appear unpalatable, and the cattle do not relish them. This is often the case when silage is first fed, but once the cattle have become used to this class of feed they will eat large quantities of it.

Early cut hay is not only more nutritious because of its smaller amount of fibre, but also on account of its better flavour and aroma, being more palatable and appetising. Succulent feeds also aid the animal digestion and have a beneficial laxative action, which is an important factor, and especially valuable for newly-calved cows. Green pastures provide excellent succulent feed, and if cows have access to them during the early stage of lactation, production will reach a high level.

Following are some rations which will be found useful in the feeding of dairy cows:—

	Dry Matter.	Crude Protein.	Carbo-hydrates.	Fat.	Nutritive Ratio.
(1)	lb.	lb.	lb.	lb.	
40 lb. silage	10·0	·52	5·4	·24	...
5 lb. copra cake	4·3	·82	2·12	·5	...
10 lb. lucerne hay	8·9	1·23	3·71	·16	...
	23·2	2·57	11·23	·90	1 : 5·1
(2)					
40 lb. silage	10·0	·52	5·4	·24	...
10 lb. lucerne hay	8·9	1·23	3·71	·16	...
8 lb. bran	7·06	1·10	3·38	·22	...
	25·96	2·85	12·49	·62	1 : 5·2
(3)					
20 lb. pumpkins	4·20	·08	1·42	·02	...
10 lb. chopped corn stalks ...	5·99	·20	3·34	·06	...
10 lb. lucerne hay	9·16	·76	3·78	·13	...
1 lb. coconut cake	·92	·13	·32	·16	...
6 lb. bran	5·28	·75	2·64	·17	...
2 lb. corn meal	1·72	·14	1·32	·07	...
	27·27	2·06	12·82	·61	1 : 6·8

	Dry Matter.	Crude Protein.	Carbo-hydrates.	Fat.	Nutritive Ratio.
(4)					
20 lb. wheaten straw ...	15·0	·02	6·77	·08	...
4 lb. molasses	3·0	·04	2·23	·06	...
4 lb. linseed meal	2·6	·93	1·98	·50	...
4 lb. soybeans	3·7	·47	2·0	·03	...
2 lb. cotton-seed meal ...	1·6	·76	·6	·57	...
	26·7	2·22	13·58	1·19	1 : 6·2
(5)					
20 lb lucerne hay	18·32	1·52	7·56	·26	...
10 lb. oaten chaff	9·11	·42	4·27	·15	...
4 lb. bran	3·52	·50	1·76	·11	...
	30·95	2·44	13·59	·52	1 : 5·7
(6)					
10 lb. chaffed corn stalks ...	5·99	·20	3·34	·06	...
15 lb. lucerne hay	13·74	1·14	5·67	·19	...
7 lb. bran	6·16	·88	3·08	·20	...
	25·79	2·22	12·09	·45	1 : 5·6
(7)					
10 lb. wheaten chaff ...	8·20	·36	4·61	·11	...
15 lb. lucerne hay	13·74	1·14	5·67	·19	...
8 lb. bran	7·06	1·10	3·38	·22	...
	29·00	2·60	13·66	·52	1 : 5·4

Potatoes for Dairy Cows.

According to Bulletin 249 of the North Dakota Agricultural Experiment Farm, feeding trials were carried out to test the value for dairy cows of potatoes as compared with maize silage. In the first trial the cows were fed what they could eat of potatoes or maize silage. In the second the cows received 40 lb. potatoes or 40 lb. silage per day. The rest of the ration, which was fed according to production, consisted of a mixture made up of 200 lb. each ground oats and ground barley, 100 lb. ground maize, 7 lb. bone meal and 4 lb. salt, with lucerne hay. Potatoes were found to be a useful feed for dairy cows up to from 25 to 40 lb. per day, on which amounts as much milk and fat were produced as from maize silage.

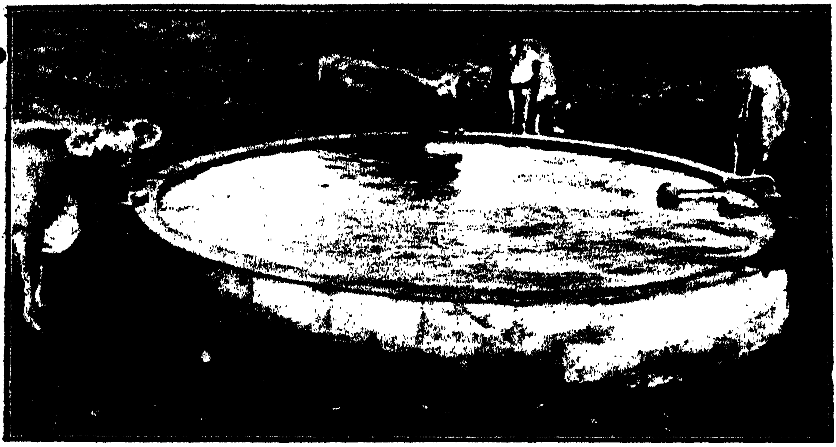
Pure Drinking Water also Essential.

Apart from suitable feed, a plentiful supply of pure water is essential if cows are to produce large quantities of milk and maintain health and condition.

Running water and troughs or reservoirs are preferable to dams, etc., and concrete seems to be the best material out of which to construct troughs or reservoirs.

The concrete reservoir illustrated is built 18 inches out of the ground, having a full depth of 2 feet 4 inches. It is 14 feet in diameter and has a capacity

of 2,200 gallons, or sufficient for a herd of eighty cows. The bottom consists of 6 inches of concrete, while the walls of this particular reservoir are built of patented moulded concrete blocks 6 inches thick. There is an outlet at the bottom for cleaning purposes, also an overflow pipe at the top, while the inflow of water is regulated by a ball cock as shown.



Concrete Water Reservoir and Drinking Trough.

While not absolutely necessary to have the trough circular, one of that shape has many points in its favour ; for one thing cows are less likely to get tipped or pushed into the trough, as it is much easier for them to get away from one another when the trough is round.

Soil Deficiency in Relation to Cheese-making.

In cheese manufacture abnormal rennet action has frequently been found to indicate that the coagulated curd will not respond to the usual methods of controlling moisture content in the cheese, and incidentally that the cutting process must in some cases be hastened and in others retarded, according to the rapidity with which the coagulum toughens and contracts.

Investigations carried out by the Dairy Branch of the Department have led to the conclusion that this trouble occurs as the result of a deficiency of certain mineral salts in the soil and a consequent deficiency in the pastures over which the cattle graze. In such areas it has been observed that milk from herds grazing on recently top-dressed pastures has been much less affected than that from herds in the immediate vicinity, where fertilisers have not been used.

A similar experience was noted when drought conditions prevailed over an affected area, in that milk from herds fed on lucerne chaff and bran became normal in its reaction to rennet and remained so until such time as supplementary feeding was discontinued.

Cool the Milk for Cheese-making.

The necessity for cooling milk on the farm in summer months is realised and practised by most dairymen. If milk is kept in the cans without being cooled it retains for some time a temperature approximating the body heat of the cow, which is the optimum temperature for the growth and multiplication of harmful organisms.

Investigations carried out last June at a cheese factory on the far South Coast by Assistant Dairy Instructor R. C. Hottes demonstrate the necessity for cooling milk, even sometimes during the winter months. In the case in point inferior milk for cheese-making was being supplied from one particular farm. The usually recommended precautions regarding the hygienic handling of the milk on the farm failed to effect any improvement, until it was discovered that the cause of the trouble was the failure to cool the afternoon's milk, which was held overnight in the cans. Following the installation of a cooling system and the treatment of the afternoon's milk, it arrived at the factory in good order and no longer interfered with the normal working of the vat of milk into which it was placed at the factory

Tubercle-free Dairy Herds.

Under the scheme for the certification of tubercle-free dairy herds, 4,554 cattle were tested by the veterinary staff of the Department's Stock Branch during the year ended 30th June last.

Sweet Potatoes on the Far North Coast.

Variety trials with sweet potatoes have been carried on for a number of years at Wollongbar Experiment Farm near Lismore. These trials have demonstrated the suitability of Brookes' Seedling, Nancy Hall, Yellow Strasburg and White Yam for this district. Brookes' Seedling is a heavy yielder, but this factor is offset to some extent by its poorer quality as compared with some of the other varieties.

Brookes' Seedling No. 3 and Director, which were under trial last year for the first time at Wollongbar Farm, gave very good yields. H.A.C. Pink and Jersey are only suitable for growing for stock food.

To Poison Sparrows with Treated Wheat.

One tablespoonful of strychnine and one of washing soda should be mixed with three pints of water and a little sugar, boiled until all the ingredients are dissolved, and then mixed with 10 to 12 lb. of wheat. The grain so poisoned should be distributed in small tins about the homestead or nailed to beams in sheds or to high posts. Better results are obtained by using the poisoned grain intermittently and by baiting with good grain for a few days before poisoning, laying the poisoned wheat when the birds have been attracted to the spot.

Proper precautions must, of course, be taken against harm to domestic stock.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
P. Ubrihien, Corridgeree, Bega	133	2 Oct., 1932
James McCormack, Tumut	98	9 „ 1932
E. E. Winder, Wybong Road, Muswellbrook	46	14 „ 1932
Lunacy Department, Parramatta Mental Hospital	33	16 „ 1932
Wagga Experiment Farm (Jerseys)	64	16 „ 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 „ 1932
St. Patrick's College, Goulburn	7	21 „ 1932
E. E. McMullen, Springnook, Holbrook	32	25 „ 1932
E. S. Cameron, Big Plain, Narrandera	31	26 „ 1932
W. R. Boughton, Holbrook	22	27 „ 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 „ 1932
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 Nov., 1932
Wolaroi College, Orange	11	19 „ 1932
Lunacy Department, Callan Park Mental Hospital	31	20 „ 1932
Berry Experiment Farm	129	26 „ 1932
J. B. Burtenshaw, "Sunnyside," Inverell	36	27 „ 1932
Parker Bros., Hampton Court Dairy, Inverell	74	27 „ 1932
W. K. Frizell, Rosenstein Dairy, Inverell	44	28 „ 1932
J. L. W. Barton, Wallerawang	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood	8	3 „ 1932
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 „ 1932
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	9	3 „ 1932
A. N. de Fraine, Happy Valley Dairy, Inverell	9	6 „ 1932
W. Pigg, Redlands Dairy, Inverell	33	6 „ 1932
Lunacy Department, Morisset Mental Hospital	27	7 „ 1932
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 „ 1932
Newington State Hospital and Home	100	17 „ 1932
W. T. Herbert, Racecourse Farm, Bega	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega	78	8 „ 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 „ 1933
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys)	80	22 „ 1933
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 „ 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 „ 1933
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
New England Girls' Grammar School, Armidale	29	3 „ 1933
Lidcombe State Hospital and Home	149	3 „ 1933
G. L. Genge, "Easton," Armidale	33	4 „ 1933
A. B. Finney, Fox Ground, Gerringong	29	11 „ 1933
George Rose, Aylmerton	3	23 „ 1933
Riverina Welfare Farm, Yanco	89	24 „ 1933
Department of Education, Yanco Agricultural High School	39	24 „ 1933
Mittagong Farm Homes	36	24 „ 1933
Liverpool State Hospital, Liverpool	72	3 Mar., 1933
Miss Brennan, Arankamp, Bowral	17	8 „ 1933
G. W. Young, "Boorganna," via Wingham	41	10 „ 1933
Lunacy Department, Kenmore Mental Hospital	80	27 „ 1933
P. M. Burtenshaw, Killean, Inverell	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra	20	6 „ 1933
A. D. Frater, "Fairview Dairy," Inverell	51	6 „ 1933
A. H. Pye, Loch Levan, Inverell	47	7 „ 1933
W. Newcomb, "Minnamurra," Inverell	72	7 „ 1933
Rydalmere Mental Hospital	77	7 „ 1933
St. Joseph's Girls Orphanage, Kenmore	11	13 „ 1933
St. Joseph's Convent, Reynold-street, Goulburn	8	14 „ 1933
St. Michael's Novitiate, Goulburn	4	14 „ 1933
Marion Hill Convent of Mercy, Goulburn	47	15 „ 1933
G. A. Parish, Jerseyland, Berry	93	21 „ 1933
Australian Missionary College, Cooranbong	72	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra	76	6 „ 1933
Koyong School, Moss Vale	3	11 „ 1933
James Wilkins, "Jerseyville," Sandy Creek Road, Muswellbrook	40	12 „ 1933
Tudor House School, Moss Vale	14	13 „ 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 „ 1933
W. Hammond, Bellingen	77	16 „ 1933
Hurlstone Agricultural High School, Glenfield	44	22 „ 1933
R. C. Nicholson, Jillamatong, Corowa	180	23 „ 1933
St. John's College, Woodlawn, Lismore	47	23 „ 1933

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
Grafton Experiment Farm	271	14 July, 1933
William Thompson Masonic School, Baulkham Hills	87	20 " 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns)	100	20 " 1933
G. V. Ralston, "Porphyry," Seaham	98	21 " 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook	36	17 " 1933
E. W. Flower, Binna Burra	56	18 " 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 " 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	26	25 " 1933
Sacred Heart Convent, Bowral	10	26 " 1933
Department of Education, Gosford Farm Homes	38	2 Sept., 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 " 1933
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 " 1934

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.

—MAX HENRY, Chief Veterinary Surgeon.

SEAWEED AS A FERTILISER.

ALTHOUGH seaweed contains all the elements essential for plant growth, it cannot be classified as an economical fertiliser on account of the relatively small amounts of these elements that are present. Seaweed varies considerably in composition, but the following mean of several analyses of seaweed collected in Sydney Harbour, Botany Bay and Port Hacking may give some idea of its composition:—

Moisture	79·1	per cent.
Ash	6·6	" "
Containing—Phosphoric acid (P_2O_5)	0·47	" "
Potash (K_2O)	1·26	" "
Organic and volatile matter	14·3	" "
Containing—Nitrogen	0·42	" "

It will be readily seen from the above figures that the actual amount of fertilising materials in an ordinary application of seaweed is relatively small. For example, 1,000 lb. of seaweed would contain only 4.2 lb. nitrogen, 4.7 lb. of phosphoric acid and 12.6 lb. potash.

Seaweed can be applied to practically any type of soil or garden, but is not sufficiently rich in fertilising material to be economically handled and transported, and for this reason its use is restricted to areas very close to the seashore, although it is questionable whether even in such localities it is utilised to any extent as a fertiliser. It is not economical for country farmers to use as the cost of collecting and transport would amount to many times the value of the fertilising compounds in the weed.

There is no recognised method for treating seaweed for manurial purposes. Some users place it in heaps and allow it to rot; some apply it direct to the land; some make it into compost heaps with other materials, and others burn the seaweed and apply the crude ash to the soil. Seaweed is, however, difficult to burn, and many varieties do not readily decay.

Butter Quality.

Factors Influencing the Results of the Past Season.

A. M. BROWN, Special Dairy Instructor.

GENERALLY speaking, the quality of New South Wales butter during the past season has not been maintained at the very high standard reached in the year 1930-31. In the months of January, February, and March the coastal dairying districts of the State, and particularly those of the far north coast and the far south coast, experienced an unusually difficult time through droughty and abnormally hot, humid weather. The dry conditions caused infrequent deliveries of cream to the factories, besides a lack of flavour in the raw product and in the resultant butter, while the excessively high atmospheric temperatures and humidity rendered it most difficult to keep cream in a satisfactory state on the farm and in transit, severely taxed the refrigeration facilities at the factories, and even in some cases adversely affected the work carried out in the churn rooms and packing rooms. All these factors can fairly be quoted as being primarily responsible for a big proportion of the falling off in quality which has taken place. The season opened with every prospect of a record production, and it seems certain that when the final figures are available it will be found that during the 1931-32 season New South Wales produced more butter than ever before, despite the severe set-back occasioned by the spell of unfavourable weather conditions. It is therefore safe to say that dairying is showing a very definite expansion.

Weather Conditions Necessitate Greater Accuracy in Grading.

The adverse seasonal conditions made the accurate grading of cream an even more important factor and a more difficult job than in normal times, for, with a general supply of what might be described as mediocre quality cream, the inclusion in the "choicest" vat of some individual doubtful lots would, of course, be more likely adversely to affect the bulk than would be the case if the general quality was of a higher standard. This statement is made with reservations as far as some types of cream are concerned, particularly in the case of those described as metallic, tallowy, or butyric. The inclusion of any of these types, no matter how good the rest of the bulk may be, is fraught with the greatest danger to quality. The cream grader has been required to exercise to the fullest degree all the care and judgment he is capable of during the past season.

Faults Due to other than Seasonal Conditions.

In the most up-to-date factories, even though they are apparently well run, but to which, of course, the human factor must always of necessity be an adjunct, there may at any time occur happenings which will adversely affect the quality of the butter produced. Some factors which contribute to

these undesirable results are breakdowns in machinery, defective plant, etc. While it is possible to reduce these happenings to a minimum by constant vigilance, it is practically impossible to escape them entirely at some time and in some form or another. It is not at all surprising, therefore, that during the past season there have been a number of instances where the quality of the butter produced by some factories has periodically been affected by these influences or happenings. The different flavours resulting therefrom have been dealt with frequently in previous articles, but it is thought desirable to discuss some of them again in order to emphasise that they are still in evidence.

Metallic Flavour.

This flavour is one which has probably been the most prevalent of the off flavours encountered during the past season. As is well known, this fault is primarily caused by the presence of metal salts in milk, cream or butter, although it may also be caused by bacterial action. Verdigris and rust are visible examples of metal salts. Trouble of this nature occurred at one factory where a tinned copper vat had not been kept properly cleaned and verdigris had formed on the portions of the sides that were devoid or partly devoid of tin. A similar condition of corrosion existed in the taps of the vats, and here again metallic flavour was the result.

It is obvious that in order to do away with this source of trouble it is necessary to have the worn parts always kept covered with a coating of tin. This applies most particularly in the case of holding and neutralising vats, where the cream is necessarily allowed to stand in contact with the bare copper for at least some time. These remarks also apply to the taps of the vats, which should be thoroughly cleansed each day.

With perhaps one exception, all the "flash" pasteurisers at present in use throughout this State are made of tinned copper, and in many cases they have become wholly or in part devoid of a coating of tin. If the bare parts are perfectly free from any casein deposit and are kept brightly polished no harm in the way of the production of metallic flavour will come to the cream passing over them, as the contact thus produced is practically instantaneous. If, however, these bare copper surfaces are neglected and allowed to tarnish and become covered with a deposit of baked-on casein they immediately become a menace to quality.

The practice adopted in many factories of running hot water through the pasteuriser and over the cooler before the treatment of the cream is commenced has much to recommend it, as it tends to remove any contaminating organisms or metal salts which may have collected over-night or since the previous cleaning of the plant.

A number of additional instances have come under notice where metallic flavour has been caused by leaks of metallic brine into the cream from leaky joints in the pipes comprising the cooler and in the coils in the holding vat.

To prevent these happenings, satisfactory workmanship at time of initial installation and erection of these items of equipment is necessarily of first importance, but the regular testing of the coils for leaks is also an additional precaution which should be taken.

"Fins" of the Cooler Adversely Affect Quality.

An unusual amount of trouble with quality has been traced to the "fins" on the pipe coolers. These "fins" are V-shaped and consist of strips of copper soldered on to the underneath portion of each pipe of the cooler. They probably received undue knocks while being cleaned, and this caused the solder to break away, thus allowing cream into the crevices formed by the V-shape of the "fins." It is impossible to get at these places to clean them, and consequently a ready source of contamination was set up, together with the formation of much veridgris. Metallic and unclean flavours were the result.

It is usually hard to locate the existence of this trouble by ordinary observations; in fact, some managers have to an extent resented the suggestions of the instructors that these "fins" could be a source of contamination, especially as they have appeared to be quite intact. However, when some of these "fins" have been removed, sufficient proof is usually available to leave no room for doubt as to their unsatisfactory sanitary condition and consequent danger to quality. In the cases alluded to the "fins" that had been removed were replaced by straight strips of tinned copper. These strips, although more frail and apt to be loosened by knocks, etc., should at least be more sanitary than the V-shaped type.

An Unusual Source of Contamination.

During the past season two instances of very bad contamination occurred in an unusual manner. These took place in comparatively new batch vats used for cream storage. The vats in question were lined with nickel, and the spindles of the coils between the stanchions had been covered with sleeves, also made of nickel, and these had been soldered on apparently to make what was considered a more finished job. The solder had broken away and allowed cream to accumulate underneath the sleeves. Butter produced from the cream in one of these vats had developed quite a rancid tendency when examined in Sydney.

There have also been additional cases of where fat-saturated churns have again been proved very conclusively to be responsible for so-called decomposed aroma as well as off flavours. In some instances the trouble has been occasioned by faulty joining, due to indifferent workmanship in the making of the churn, which has allowed cream to become deposited in joints or cracks, from where its complete removal is impossible by ordinary cleansing methods. The spindles of both internal and movable "workers" have also at times provided contaminating influences, together with accumulations of rust.

In connection with the cleansing of churns, it has been noted on occasions that insufficient care is taken to see that the water used for treating the

churns and workers is hot enough to be effective. It should be kept in mind that on no account should the temperature of this water fall below 185 deg. Fahr. The use of a good cleansing powder and, preferably, boiling water for removing organic matter such as the fat and as a means of destroying any living organisms present, together with periodical application of lime as a deodorant, are recommended for effective churn treatment. Lime also has a hardening effect on the timber of the churns. Washing soda has an opposite effect, and for this reason its use in churn treatment is inadvisable.

The fact that production kept up well into the winter months last year no doubt had a distinct bearing on any faults caused by breakdowns and faulty plant, as in many instances it precluded the overhauls and repairs usually carried out when supplies of cream are at their lowest.

The Human Factor.

In reviewing the different factors responsible for inferior quality butter during the past season, the human factor, as usual, appears to have played a prominent part in the results referred to. The members of the factories' staffs who carry out the cream grading, cleaning operations, treatment of cream or manufacture of butter, etc., constitute this human factor. It is true that the capacity for correctly and efficiently performing these different duties may vary with the individuals concerned, some also having a lower standard of cleanliness than others. These shortcomings, whether they be natural or acquired, need rectifying. This being the case, more than sufficient justification is indicated for instruction and supervision by the officers of the Dairy Branch, and for factory managers themselves to impress upon employees the importance of always maintaining the efficiency necessary to ensure the production of the highest quality butter. There appears to be a greater tendency nowadays on the part of the employees to take a pride in the quality of the output of the factories with which they are associated, and interest will be sustained in this direction if the suggestione just made are acted upon.

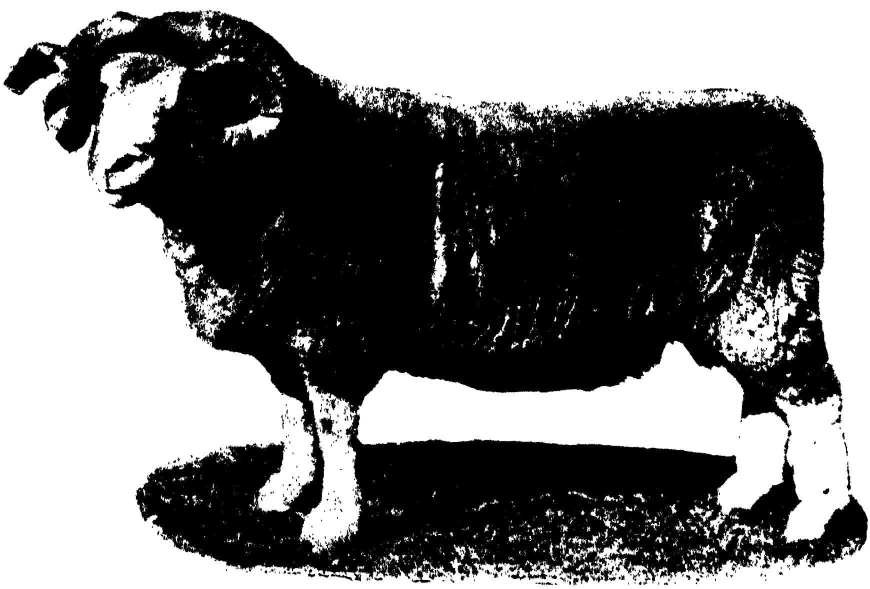
In conclusion, it is sincerely hoped that the endeavour to obtain the greatest possible amount of choicest or best quality butter will still continue to be the aim of the factories in New South Wales, for, despite what may be heard to the contrary, it is by this means that the greatest benefit will accrue to the dairy farmers and manufacturing companies, besides providing a very real asset to this State and to the nation as a whole.

PAMPHLETS ON CHEESEMAKING.

THE Department of Agriculture has just published two pamphlets on cheesemaking, one (for free distribution) giving directions for the making of cheese in the home, and the other (for sale, price 1s. 1d. posted) dealing with the manufacture of all types of cheese on a large scale. Both publications are obtainable from the Department, Box 36A, G.P.O., Sydney.

The Department's Dorset Horn Stud at Wagga.

THE Deparment's Dorset Horn stud at Wagga Experiment Farm has reached a very high standard, as evidenced by the successes at the recent Wagga show and at the Sydney sheep show in June last. Keen competition was met at both shows, particularly at Wagga, in which district are to be found a number of very high-grade studs of the Dorset Horn breed. At Sydney, local and interstate competition had to be met, but the Department's entries were successful in every class in which they competed.



Dorset Horn Ram, 14 Months Old—First Prize.

Prizes at the Sydney Show—

Ram under $1\frac{1}{2}$ years ...	First prize.
Ram bred by exhibitor...	First prize.
Ewe under $1\frac{1}{2}$ years ...	First and reserve champion.
Pen of two rams... ...	First prize.
Pen of two ewes... ...	First and second prizes.

Prizes at the Wagga Show—

Ram $1\frac{1}{2}$ years and under $2\frac{1}{2}$ years	First and champion.
Ewe 1 year or under ...	First and reserve champion.
Pen of two ewe lambs...	First prize.
Pen of ram lambs ...	First prize.
Shorn ram	Second prize.
Shorn ewe	Second prize.

In the judge's opinion, the champion ram at the Wagga show is "a super-excellent specimen of the Dorset Horn breed."

The ram lambs at Wagga farm have just been classed and are available for sale at $4\frac{1}{2}$ guineas f.o.r. Bomen. These young rams will be ready for service by the end of October or early in November.

Fat Lamb Breeding Competitions.

Valuable trophies have been donated for the fat-lamb breeding championship competitions which it is intended to conduct next year. The competition is open to all fat-lamb breeders in New South Wales, and entries, which should be forwarded through local branches of the Agricultural Bureau or other producers' organisation, will close on 28th February, 1933. To become eligible to compete it will be necessary for an organisation to forward not less than four entries. Judging will commence on 1st April and continue till 30th September, 1933. It is imperative that owners, when submitting their entries, should state when they wish their flocks to be judged.

An entry shall comprise fifty ewes of a commercial flock suitable for raising fat-lambs for export, the ewes to be either crossbred, comeback or Merino and each to have a lamb at foot, although the lambs will not be judged. The ewes need not necessarily have been bred by the owner, but must have been in his possession since mating time. Two representative rams must also be shown for judging as to suitability for production of export lambs. These rams must be portion of the ram flock used to produce the lambs shown. Stud sheep are ineligible to compete.

The scale of points on which the entries will be judged is as follows:—Type of ewe, 40 points; type of ram, 30; uniformity of ewes, 20; condition of wool and sheep, 10; total, 100 points.

Enrol now for Hawkesbury Agricultural College Diploma Courses.

A number of applications for admission to the diploma courses at Hawkesbury Agricultural College next year have already been accepted, leaving only a limited number of vacancies available. As, subject to compliance with examination and other requirements specified in the College prospectus, applications are dealt with in order of receipt, those desirous of being considered for admission next term, which commences on 30th January, 1933, would be well advised to forward their applications at once.

Application forms and prospectus are obtainable from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Flaying and Curing Hides and Skins.

The practices responsible for imperfect hides, and the correct methods of slaughtering, skinning, curing, and marketing hides and skins are discussed in detail in a pamphlet issued by the Department.

If consignors improved their method of handling the hides, city buyers would quickly realise the fact and pay accordingly. By disposal on the farm to country dealers the hides eventually lose their identity, and the careful man is not compensated to the full extent for the care he may have exercised. Hides and skins may be forwarded in large or small parcels to the various stores and sold on account of consignors. Clean, well-cured, good-shaped hides, free from scores, cuts, blemishes and "slip," will fetch top values.

The publication from which these few hints were taken is well illustrated and is obtainable free on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Alternate Cropping of Apples.

Its Effect upon the Industry in New South Wales.

F. T. BOWMAN, B.Sc.Agr., Fruit Instructor.

The alternate or biennial cropping of apples is a condition of wide occurrence and of considerable importance to the apple industry. It affects not only the growers directly engaged in the industry, but also agents and distributors, shipping companies, overseas agents, and all those who find occupation in the handling of fruit after it leaves the orchard, as well as case-makers, spray and paper manufacturers, etc.

What it Means to the Orchardist.

In the following table is given the production in bushels of five orchards in one of the main apple-growing districts of New South Wales. Only main varieties, such as Granny Smith, Jonathan, Delicious, Democrat, and London Pippin are grown, and the figures in each case are from a similar number of trees of full-bearing age each year.

Table Showing Fluctuation in Production from Year to Year.

	Orchard No. 1.	Orchard No. 2.	Orchard No. 3.	Orchard No. 4.	Orchard No. 5.	Total of the Five Orchards.
	bus.	bus.	bus.	bus.	bus.	bus.
1928	2,738	6,106	4,677	10,096	3,727	27,346
1929	569	2,118	450	1,040	1,456	5,633
1930	1,127	6,861	6,772	16,264	4,303	35,327
1931	564	2,706	4,332	7,498	867	15,967
1932	275	2,839	587	3,496	1,304	8,501
Average of five years ...	1,055	4,126	3,364	7,679	2,331	18,555

These marked annual variations in yield obviously cause considerable dislocation of orchard routine, such as the control of major pests like codling moth, the uneconomic use of plant and equipment (packing and spraying machinery, for example), and make it difficult to assess the amount of labour, spray and packing materials required.

Even greater fluctuations take place in the production of certain varieties, as shown by the following table, which was compiled by the New South Wales Director of Marketing from the reports of district fruit inspectors.

SHOWING Fluctuations in Yields of Leading Varieties in New South Wales.

Variety.	No. of Bearing Trees. (1928 Census).	Estimated Crop.	
		1929–30.	1930–31.
		bus.	bus.
Granny Smith	216,000	455,000	338,000
Jonathan	190,000	337,000	352,000
*London Pippin	81,000	193,000	82,000
*Rome Beauty	79,000	158,000	71,000
*Delicious	43,000	74,000	31,000
Tasma	35,000	55,000	45,000
Gravenstein	35,000	79,000	67,000
*Pommo de Neige	35,000	50,000	35,000

*Varieties noted for alternate cropping habit.

The effect on the size and quality of fruit is also very marked. In off-bearing years apples grow above normal size, often too large for best commercial purposes, while in the heavy-bearing years much fruit is small and often unmarketable. Thinning to increase size, in addition to being a costly operation, is not always possible because of interference with essential routine duties like codling moth control and cultivation. Moreover, the over-sized fruit in off-bearing years is particularly liable to develop physiological troubles such as watercore and breakdown, while in years of heavy production the rush at harvesting time prevents the exercise of due care in picking and packing. Also, in heavy years, much immature fruit is picked early to relieve the load on the trees. Such fruit is often liable to develop bitter pit during storage. The physiological troubles mentioned become more apparent during storage, and are an important cause of wastage in export shipments of fruit to the United Kingdom.

To add further to the orchardist's troubles, prices invariably fall in years of heavy bearing and total expenses rise. In off-bearing years the price per case is good, but total income is below normal because of the light crop.

PRODUCTION and Prices of Apples, 1926 to 1931.

Year.	Total State Production.	Average Ruling Prices of Chief Commercial Varieties.
	bus.	s. d.
1925–26	759,742	9 8
1926–27	408,383	13 4
1927–28	1,254,074	5 0
1928–29	639,720	14 9
1929–30	931,486	7 0
1930–31	908,705	7 2

The effect of alternate cropping on price stability and market organisation must be considered largely the reason why the apple grower, of all primary producers, receives the lowest nett profit for his produce. According to the report of first Bathurst (N.S.W.) Conference of Producers and Consumers, 1926—

Apple growers receive only 27 per cent. of the retail price.

Pear and orange growers receive 34 per cent. of the retail price.

Pea growers receive 44 per cent. of the retail price.

Bean growers receive 49 per cent. of the retail price.

Maize growers receive 55 per cent. of the retail price.

Wheat growers receive 83 per cent. of the retail price.

In years when normal crops are produced, the grower is able to sell at a profitable price. It is, therefore, to the advantage of the grower that he take every step to secure good average crops, which would benefit him in the following ways:—

1. The fruit would be more even in size and quality.
2. Better average prices would be obtained.
3. Losses would be minimised.
4. To a large extent rush periods of harvesting, packing and marketing would be minimised.
5. Employment would be more regular.
6. The industry would be stabilised and all subsidiary industries would also be stabilised.

How Consumers are Affected.

Not only would prices be stabilised, but consumers would also have the choice of a wider range of better fruit from year to year if crops were more regular. Buyers become accustomed to obtaining a certain size of a certain variety of apple, and when it is not obtainable in many instances they will not purchase another variety, consequently consumption decreases. With regular cropping, apples would be obtainable over a longer period of the year.

The foregoing applies not only to local consumers, but to consumers in the export markets as well.

Agents and Distributors are Seriously Inconvenienced.

In building up trade, overseas and local, continuity of supply is essential, and continuity of supply involves not only regularity in regard to quantity but also regularity in regard to sizes, varieties and types. In some years agents lose considerable trade because of their inability to meet distributors' demands for certain quantities and sizes of certain varieties. In regard to sizes and varieties each market has its particular preferences; the likes and dislikes of customers must be studied and catered for. This can be done only if supplies are stabilised.

The following is a case in point. In the 1929–30 season, trial shipments of Granny Smith apples were sent to the East. The shipment was well received, but cases containing 165 apples were preferred, and cases of the same count were asked for during the 1931–32 season. During that season, however, the crop of Granny Smith apples was light and the individual fruits were abnormally large, so that it was impossible to get enough fruit of the size required to pack 165 to the case. Cases were forwarded with counts of 100 to 110 to the case, but buyers were disappointed and the price fell 6s. to 7s. per case. Eastern agents, as a consequence, endeavoured to obtain their supplies from New Zealand.

In the United Kingdom and on the Continent, Australia is gradually losing her apple trade. The reasons are numerous, but the chief one is unreliability of supplies, caused by the alternate cropping of our trees. Supplies for the United Kingdom and the Continent are obtained chiefly from America. It might be thought that since Australian and American seasons do not synchronise there would be an open season in the United Kingdom and the Continent for Australian apples. But America by utilising cool storage is keeping up a supply of apples all the year round and is gaining ground, whilst Australia is losing.

From the agent's point of interest, regularity of crops would mean :—

(*a*) That they would have confidence in booking orders and in making forward contracts.

(*b*) That they would be in a position to open up branches and extend operations.

(*c*) That they would be in a much better position to push Australian fruit trade against other competitors.

How Alternate Cropping Affects Shipping.

Shipping companies are put to considerable inconvenience and expense in years of heavy cropping in making extra space available to carry fruit overseas.

The Australian export season is short, and in a year of heavy bearing so much fruit has to be moved in such a short time that all types of vessels have to be brought into commission. Many of these are ill-equipped for the purpose they are made to serve, consequently much fruit is landed overseas n bad condition. On the other hand, in off-bearing years it is difficult to fill the regular steamships, which are fitted with satisfactory refrigeration space.

Regular crops would mean that shipping companies would make available ships properly equipped for the sea carriage of all the fruit offering each season. The fruit would consequently be landed in better condition, and a reduction in freight would most likely be obtained, as well as reduction in time of voyage from port of loading to port of discharge.

The following figures show the marked fluctuations in the quantities of New South Wales apples exported during the past nine years.

PRODUCTION and Export of New South Wales Apples, 1922-31.

Year.	Bearing Trees.	Production.	Export.
	No.	bus.	bus.
1922-23	708,064	723,522	35,841
1923-24	752,812	522,771	8,425
1924-25	773,691	842,329	32,325
1925-26	832,110	759,742	22,287
1926-27	848,490	408,383	7,767
1927-28	936,587	1,254,074	53,362
1928-29	965,816	639,720	20,522
1929-30	954,008	931,486	72,850
1930-31	967,164	908,705	75,717

Carne (in *Journal of the Council for Scientific and Industrial Research*, Vol. 4, No. 2) points out that the disorganisation of Australian export trade, rather than quality of fruit, is responsible for New Zealand fruit averaging 2s. to 3s. per bushel more than Australian fruit.

YIELDS OF TUNG OIL.

IN view of the increasing interest in the growing of tung oil trees in this country, the following paragraph from *The Country Gentleman* (U.S.A.), is informative as to what might be expected in the way of yields.

The average annual yield of tested trees over a ten-year period, as reported by the University of Florida Experiment Station was 24.08 lb. of dry shelled nuts per tree. On crushing, the nuts were found to yield 33⅓ per cent. oil. On this basis, the average annual yield per tree for the ten years would be about 8 lb. oil. The average price over the same period was between 14.02 and 15.54 cents per lb. Each tree, therefore, produced approximately $1.20 worth of oil in a year. An acre with sixty trees would yield $72. Each year the trees increase their yield until fifteen years old.

The writer also adds that after the trees are big enough to shade the ground they need very little cultivation. A very important factor in keeping down the expenses is the use of livestock in the groves. They do not harm the trees, but gather the grass and cover crop, and whatever they gain in beef is, of course, a profit, whereas it would cost actual money to cut this grass and cover crop so that the nuts can be easily found. Where the weeds and grass grow high under the trees it is expensive to gather the crop and difficult to find the nuts.

Brown Vegetable Weevil now Attacking Tomatoes and Potatoes.

The Entomologist of the Department (Mr. W. B. Gurney), advises that the brown vegetable weevil, or elephant beetle (*Listroderes obliquus*), has already made its appearance on early tomato and potato crops. He points out that this pest attacks most vegetable crops, and breeds in many weeds; cape weed and marsh mallow are particularly favoured by it.

In the autumn and winter the larval, or grub stage of this beetle occurs. The grubs are stout, greenish-white, and legless, with small brown heads. In addition to attacking turnips, beetroot, carrots, and parsnips, they occur on most weeds. In August and September the grubs pupate, and during September and October adult beetles emerge and proceed to attack early potato and tomato crops.

These beetles, which so frequently invade the early crops referred to, are typical weevils, with mouths elongated into snouts, or trunk-like structures. They are brown or buff coloured, and about one-third of an inch in length. The beetles shelter in the soil beneath the plants during the day, and feed at night upon the foliage, giving the plants a bare and ragged appearance. When an outbreak occurs the beetles can always be found by searching the soil at the base of the plants.

Mr. Gurney states that the beetles are readily controlled both on potatoes and tomatoes by spraying or dusting with lead arsenate. The spray recommended is 1 lb. lead arsenate powder, or 1½ lb. lead arsenate paste to 16 gallons of water. For dusting use a 25 per cent. lead arsenate dust, that is, one containing one part by weight of lead arsenate to three parts of filler, such as hydrated lime or kaolin.

It is considered that for potatoes the cost per acre for spray materials would be about 5s., and for dusts, 8s. to 10s. For tomatoes the cost would be considerably less. Dusting is more effective than spraying, and takes only about a third of the time. Lead arsenate dusts may be obtained ready mixed with the filler. The machines (which cost from £3 to £4) for applying these dusts, may be obtained from firms which deal in insecticides and fungicides. The best type of pump for spraying would be the knapsack spray pump.

When in the autumn and winter the greenish-white, robust larvae of this beetle are attacking turnips, carrots, beetroot, etc., arsenical sprays or dusts may again be used.

Mr. Gurney also points out that if a crop has to be replanted in the autumn owing to an outbreak of these grubs, or if ground that is overrun with weeds is to be planted, an excellent way of preventing damage to the crop is to clean up the ground thoroughly, and then two or three days later scatter over the ground chopped-up marsh mallow or cape weed that has been treated with lead arsenate. The grubs, and even the adult beetles, will readily feed upon the bait if it is distributed late in the afternoon, so that it may remain fresh overnight.

A chart indicating the common pests of vegetable crops and showing what, when and how to apply the best known control measures, is issued free by the Department of Agriculture, Box 36A, G.P.O., Sydney. The full title is: "Insect Pests of Vegetables—A Chart of Control Measures."

Cold Storage of Passion Fruit.

FACTS OF VALUE TO INTENDING EXPORTERS.

In view of the possibility of establishing an export trade in passion fruit, experiments were designed and carried out by Messrs. C. G. Savage (Director of Fruit Culture) and A. A. Ramsay (late Chief Chemist) to ascertain whether whole fruit, pulp and juice could be successfully held in cold storage for periods sufficiently long to enable them to be shipped overseas. The fruit, pulp and juice were stored in the Municipal Cold Storage Works, Sydney, under the direction of the Manager, Mr. Willis J. Williams. A summary of the results of the experiments is given hereunder.

PASSION FRUIT cold storage experiments with the fruit, juice and pulp of both the summer and winter crops were commenced in 1929. Samples of fruit and juice were held at temperatures of 36 and 10 deg. Fahr. and were examined at frequent intervals for deterioration of flavour and for decomposition.

Storage of Pulp and Juice.

The pulp and juice from the winter crop held satisfactorily for only just over four weeks at 36 deg. Fahr., whereas the juice from the summer crop held for seven weeks, and then only a slight deterioration was noticed, while even after eleven weeks it was still palatable. Pulp from the summer crop kept satisfactorily for eleven weeks at 36 deg. Fahr., though at the end of that period the flavour and aroma had slightly deteriorated. At 10 deg. Fahr. juice and pulp from both crops held in a satisfactory condition for a considerable period—as long as two years and three months in the case of summer passions.

From these tests it would appear that under normal conditions pulp and juice could be successfully shipped overseas at temperatures between 32 and 36 deg. Fahr. The products, however, would have to be used immediately after removal from storage, as deterioration rapidly sets in after being taken out of storage. There is no doubt, taking these results as a guide, that pulp and juice could be successfully exported if stored at 10 deg. Fahr., but care would have to be taken to allow for an expansion of 5.3 per cent. in the volume of the products due to freezing.

Storing Whole Fruit.

Some of the fruit for this test was packed in ground peat moss and the remainder without moss and stored at 36 deg. Fahr. During the first week in storage both lots of fruit became slightly wrinkled, while that not packed in moss showed very slight mould growth, which developed slightly more during the second week. By this time, also, the skins of both lots were becoming "papery." When the fruit had been six weeks in store,

although mould growth had not increased noticeably on the fruit that was not packed in moss, it had developed on the moss-packed fruit. Moreover, the skins had become very thin and the flavour of many of the fruits had appreciably deteriorated.

Although, on the whole, none of the fruit held sufficiently long in a satisfactory condition to indicate that it could be safely shipped overseas at 36 deg. Fahr., the moss-packed fruit came through the test with a slightly better appearance than the other. Further storage tests may indicate that whole passion fruit can be exported at a lower temperature.

Pleuro-pneumonia: Kiama-Eden Quarantine Line.

The Chief Veterinary Surgeon of the Department of Agriculture, Mr. Max Henry, directs attention to the fact that a quarantine line has been proclaimed under the provisions of the Stock Diseases Act, 1923, around the Pastures Protection District of Kiama, that portion of the Braidwood Pastures Protection District formerly known as Broulee Pastures Protection District and the Eden Pastures Protection District.

The object of this line is to prevent the introduction of pleuro-pneumonia contagiosa into the districts concerned, and regulations governing the movement of cattle across the quarantine line require that all persons consigning cattle to destinations within the area must first obtain a license. Such licenses are issued by the District Inspector of Stock or other officers authorised.

All inquiries concerning the despatch of cattle to these coastal districts should be made to the District Inspector of Stock.

A penalty is provided for breach of the Regulations in the sum of not more than £50 for the first offence, and of not less than £30 nor more than £100 for the second or any subsequent offence.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Narrandera (J. D. Newth)...	... Oct. 4, 5
Bribbaree (K. McCallum) ...	... „ 5
Walbundrie (H. G. Collins)	... „ 5
Leeton (E. C. Tweedie) ...	... „ 11, 12
Carcoar	... „ 12
Ariah Park (M. Collings) ...	... „ 12
Morisset (E. G. Carroll) ...	... „ 12, 13
Corowa (H. G. Norton) ...	... Oct. 13, 14
Griffith (M. E. Sellin) ...	... „ 18, 19
Millthorpe (A. R. Ewin) ...	... „ 18, 19
Deniliquin (P. Fagan) ...	... „ 19
Cootamundra (G. B. Black)	... „ 25, 26
Ardlethan (E. C. Knight) ...	... „ 28

1933.

Newcastle (P. Legoe) ...	... Feb. 22 to 25
Mudgee (T. P. Gallagher) ...	... Mar. 14, 15, 16
Bellingen (J. F. Reynolds)	... „ 21, 22, 23
Dungog (W. H. Green) ...	... Mar. 30, 31, Apl. 1
Kempsey (E. E. Mitchell)...	... April 26, 27, 28
Casino (E. J. Pollock) ...	... May 16 to 18

Orchard Notes.

October.

H. BROADFOOT, Special Fruit Instructor.

Codling Moth.

In the earlier districts growers will have already taken active steps to combat the codling moth, but in the later districts the first steps in control will be commenced during the current month. There should be little need to stress the fact that the measures adopted must be timely and thorough. The methods of control are well known to almost every grower, and they include thorough inspection of all sheds, packing cases, and bandages. It is always well to remember that one season's infestation is due to the carry-over grubs of the previous season.

The first or calyx spray is one of the most important controls. The spraying should be forcible enough to drive the poison into the calyx, otherwise the spraying loses much of its efficacy. Care should be taken to use the exact quantity of lead arsenate prescribed and the mixture should be thoroughly mixed before commencing to spray, and should be kept well agitated during the operation. There is no danger of poisoning bees by spraying apple, pear or quince trees at the calyx stage provided the first or calyx spray is applied at the correct time. The first application should not be commenced until the majority of the petals have fallen, and the work should be completed before the calyces close.

Certain measures are compulsory under the Plant Diseases Act, and owners and occupiers will do well to make themselves conversant with what the law requires of them in the matter of control of codling moth.

The regulations require growers to:—

1. Thoroughly spray all apple, pear and quince trees and suckers four times every year with arsenate of lead in the proportion of not less than 24 ounces of dry arsenate of lead powder or 48 ounces of arsenate of lead paste to 50 gallons of water at the following times, viz., the first spraying to be commenced when the majority of the petals have fallen and to be completed by 30th October, the second spraying to be commenced three weeks from the commencement of the first spraying and to be completed by 20th November, the third spraying to be commenced three weeks from the commencement of the second spraying and to be completed by 11th December, and the fourth spraying to be commenced four weeks from the commencement of the third spraying and to be completed by 8th January.
2. Keep all apple, pear and quince trees free from loose bark and broken limbs, and keep all crevices or cavities in such trees free from the larvae and pupae of *Cydia pomonella* (codling moth) and destroy by burning all such larvae, pupae and litter arising from the removal of the loose bark and broken limbs and from the cleaning of the crevices and cavities.
3. Collect and remove from the orchard all fallen apples, pears and quinces at intervals not exceeding seven days.
4. Destroy all infested and waste apples, pears and quinces at intervals not exceeding seven days by boiling for ten minutes, or by burning, or by placing in a pit suitably covered.

An insect-proof covered pit is an easy and efficient means of disposing of waste and infested fruit. Details of such a pit are obtainable from the Department.

Black Spot of Apple and Pear.

In districts where black spot occurs the following programme is recommended as the most likely to give excellent control.

1. Spray with Bordeaux mixture (6-4-40) or lime-sulphur, 26 deg. Baumé (1 in 14) at "spur burst" stage; Bordeaux for preference.

2. Lime-sulphur (1 in 14) at "pink" stage.

3. Lime-sulphur (1 in 35) at calyx stage when the petals are falling, combined with the arsenate of lead spray for codling moth.

4. Lime-sulphur (1 in 35) combined with the first, second, and third "cover" sprays of arsenate of lead, if necessary.

Bordeaux mixture is liable to produce russeting of apples or pears if used after the "spur burst" stage.

Lime-sulphur when combined with arsenate of lead is liable to leave a deposit on the fruit and leaves, which reduces the market value of the former and has a detrimental effect upon the tree through its action upon the latter. This objection may be overcome by the use of calcium caseinate, used in the proportion of 1 lb. of calcium caseinate to 80 gallons of spray. Calcium caseinate should be mixed by gradually blending it with small quantities of water until it is brought to the consistency of cream. This procedure will obviate difficulty in mixing and the formation of lumps. When combining the solutions, the arsenate of lead should first be placed in the vat, then the calcium caseinate and finally the lime-sulphur. It is advisable to use the spray as soon as possible after it is prepared and care should be taken to see that it is kept thoroughly agitated when being applied.

Many varieties were ready to receive their "spur burst" application in September, and some ready to receive the "pink" application, whilst some of the late varieties in late districts will be at the correct stage to receive the "spur burst" and "pink" applications this month.

Apple Leaf Jassid.

This pest is injurious in two ways. First, it causes damage by sucking the sap from the leaves, which prevents them functioning properly, and if the attack is severe, heavy defoliation may result. Injury to the foliage means partial starvation of the fruit and tree, and the weakening of the tree may not only affect the current but also the following season's crop. Again the fruit is directly disfigured by the excreta from the insect.

The jassid can be killed in the larval stage with tobacco wash or nicotine sulphate (40 per cent.) diluted 1 to 600 of water by volume. The nicotine sulphate can be added to the lead arsenate spray for codling moth. In the larval stage it is generally found on the back of leaves; if the jassid is allowed to reach the winged stage, its control is not possible.

Black Peach Aphid.

Where this aphid is present on peach, nectarine, or Japanese plum trees it should be thoroughly sprayed at once with tobacco wash or nicotine sulphate (40 per cent.) diluted 1 part to 600 parts of water by volume, to which is added soap at the rate of 1 lb. to every 25 gallons of spray. The trees should be examined after not more than three days, and if any live aphids can be found the application of spray should be repeated.

If the interval between sprays is delayed too long the aphids will breed up as thick as they were before and the effort will be wasted.

Black Spot and Downy Mildew of Vine.

Grape vines liable to black spot should receive an application of Bordeaux mixture (6-4-40) as soon as the shoots burst out and an application of Bordeaux mixture (6-4-50) later. Should weather conditions favour downy mildew, the applications of Bordeaux mixture for black spot will serve to protect the vines from it, but the sprays must be continued till later in the season for downy mildew than for black spot.

Budding or Grafting of Citrus Trees.

Spring budding and grafting of citrus trees may now be performed; good buds inserted now often take better than "dormant" buds that were inserted in the autumn. One of the difficulties in the spring is to obtain buds that have not already "shot" and grafting is often used. The tree must be cut off cleanly to the limbs which it is desired to insert the grafts into, and a very sharp knife used to pare the scions down to the required thickness.

The bark is slightly opened and the slips of grafting wood inserted and tightly bound round with waxed cloth. The top of the cut limb should be covered with a preparation of grafting wax made up of 3 lb. resin, 2 lb. beeswax, 1 lb. mutton tallow. Melt all the ingredients together and keep warm when applying with a brush to the wound.

In cases where spring and summer budding are practised, the tops of the stock may be removed to within six inches of the bud as soon as the buds are well set or about three weeks after their insertion. Where buds were inserted last autumn the stocks can be cut back close above the bud. As the shoots develop they should be tied to a stake or stub of limb to prevent them being blown off.

After-care of Buds and Grafts.

Upon grafted or budded stock there is always a chance of growths from the stock developing so vigorously as to rob the bud or graft of nourishment.

Periodical thorough examination should be practised to keep such growths in check, but at the same time, some shade for the stock, particularly when old trees have been budded or grafted, is desirable, and consequently all shoots from the stock should not be removed. Rather pinch back the shoots so that they may shade the stock until the grafts or buds have

developed sufficiently to form a head. Sometimes scions fail, and to meet such a contingency ample shoots from the stock should be left and budded later.

Cultivation.

The cultivator should be kept at work in order to maintain the surface soil in good condition. Besides helping to maintain a surface mulch the cultivator will destroy weed growth. In fact its use does more than this: it encourages vigorous tree development and vigorous bud development. Keeping the soil in good tilth is a very important factor in successful orchard management.

A Wood-rot Fungus.

Mr. W. A. Birmingham, Assistant Biologist, has supplied the following notes upon a wood-rot fungus, *Polystictus versicolor,* which observations during the past few years have shown to be widespread and which has been found attacking both stone and pome fruits. In the case of apples and pears, invasion occurs where trees are cut back for re-working, and the cut surfaces left unprotected against entry by the fungus. In stone fruit trees the fungus gains admission where large limbs have been cut back or cut out owing to sour-sap, etc.

The fungus responsible causes the death of the bark and wood, and as it extends a reddish-brown discolouration of the bark may occur, accompanied by cracking at the junction of the affected and the non-invaded parts. On the dead parts bracket-like outgrowths ultimately develop. These can be recognised by conspicuous zones or streaks of various colours on the upper surface of the bracket. The grafts become sun-scalded in appearance and die out.

For the control of this fungus the following measures are recommended:—

1. When de-heading for re-working to another variety do so well up on the limbs to be re-worked, so as to avoid a large cut area open to invasion. When cutting out or cutting back limbs in stone fruit trees, treat as in No. 4.

2. Allow sufficient lateral growth to remain to allow the tree to continue to function and to prevent sunscald.

3. Insert a number of grafts, so as to draw the sap on all sides, and prevent dying out in parts of the limbs re-worked.

4. Treat the cut surfaces of limbs periodically with bluestone paint, made up in the following proportions:—copper, sulphate (bluestone) 1¼ lb.; freshly-slaked lime, 1 lb.; water, 2 gallons. When dry follow with a coating of white or red lead.

5. Where the disease has extended down the limb, cut away all diseased bark and wood with a sharp knife or chisel, working well back beyond the diseased parts, and treat as in No. 4. In cases where the disease has reached well down on to the main limbs or trunk, it would be better to remove and burn the tree, rather than attempt treatment.

6. In districts where the disease is prevalent, an application of Bordeaux mixture (winter strength, 6-4-22), while the trees are dormant, will considerably reduce the risk of infection.

Planting Citrus.

Mr. G. W. Beverley, Fruit Instructor on the Murrumbidgee Irrigation Area, points out that a good many growers favour the planting of citrus early in this month, and that during past seasons very late frosts have cut young trees which were planted earlier. Care must be taken to water immediately after planting, even if only a bucketful is applied round the roots to settle them in. Afterwards a good mulch of straw or dried out weeds may be placed round the stem of the tree, which should be wrapped either in a straw or paper covering to protect the young and tender bark from the hot sun and drifting sand which will do a great deal of harm to young trees.

Many plant their trees too deeply, and do not allow for the sinking of the ground after the soil settles back in the hole; the union of the stock and scion should be kept well clear of the ground level.

Citrus trees that have been budded should receive particular attention and all superfluous shoots should be carefully removed, cutting them clean off and not breaking them off as is so commonly done. A clean wound heals far quicker than a ragged one, and where shoots can be rubbed off by hand in their early growth without leaving any wound it is far better to do so.

Apricot Thinning.

There is every prospect of a fairly heavy setting of fruit this season on apricots, plums and prunes; if the setting is in proportion to the show of blossom, then thinning will have to be resorted to. Last season, even when thinning was done somewhat severely, the apricots still set and matured a very heavy crop and the fruit was somewhat on the small side. Apricots are now returning good prices for a first class dried article. Care should be taken to produce only the best of dried fruit in all lines; thorough cultivation, together with judicious irrigation, and an application of manures during the winter months, all tend towards the production of good fruit; merely thinning the fruit in itself will not ensure the production of a first-class article.

Amended Bunchy Top and Banana Borer Regulations.

Whereas previously Regulation No. 29 under the Plant Diseases Act provided that the owner or occupier of land within a quarantine area, after spraying the whole surface of a bunchy top infected plant with a contact insecticide in such a manner as to kill all aphids on it, was immediately to dig the plant out of the ground and split each stem longitudinally, it is now necessary, after digging out the plant, to take steps immediately to split the stem longitudinally along its whole length into at least four pieces. As hitherto, the corms of the infected plants must also be sliced into sections not exceeding one inch in thickness. Similar treatment is necessary where, for a period of six months, the owner or occupier of the land within a quarantine area has failed to comply with the regulation requiring the ground surrounding any plant of the genus in question to be kept free of weeds for a distance of not less than two yards from the plant.

Regulation No. 30, as amended, requires every owner and every occupier of land within a quarantine area on which there is any plant of the genus Musa infected with banana borer to cut off all the spent stems of the plant six inches above the level of the soil, and immediately split the severed spent stem longitudinally along its entire length into at least four pieces. The remaining six inches of each spent stem must forthwith be cut off at soil level. The cut surface of the corm and the lower surface of the six-inch portion of the spent stem must be thoroughly dusted with a mixture consisting of one part by weight of Paris green and twenty parts by weight of pollard or flour. After dusting, the six-inch portion of the spent stem must be replaced on the corm so that the dusted surfaces are together.

A Further Caution to Banana Growers.

In his annual report, Mr. L. D. Campbell, Banana Inspector, Coff's Harbour, includes a note of warning concerning the planting of bananas on unsuitable soils and in unfavourable locations. This warning note is timely and justified, for should a fall in prices follow the greatly increased production that is already in view, only those plantations on the most favourable soils and sites are likely to remain payable.

Mr. Campbell records an increased acreage of 570 acres (from 1,072 to 1,642 acres) in the Coff's Harbour district last year, and estimates that about another 400 acres will be planted this season. As evidence that many plantations are on unsuitable sites, Mr. Campbell points to the damage done by frosts during the past winter. The growers had been warned as to the unsuitability of these low-lying areas. Another factor of importance in the growing of bananas is shelter, and it is pointed out in Mr. Campbell's report that far too much timber was being felled without first giving consideration to the fact that some of it might with advantage be left to serve as a windbreak.

The Local Production of Vegetable Seeds.

Commenting, in his annual report, on the possibilities of the seed production industry in New South Wales, the Director of Agriculture (Mr. A. H. E. McDonald) states that although the production of seeds of onions, tomatoes, cucumbers, cauliflowers and swede turnips increased during the past year, there was still room for greater production of vegetable seeds without looking to seedsmen for a market. Little encouragement had been given by seedsmen, and where quotations had been made the prices offered (15s. per lb. for tomato seed and 5s. per lb. for cucumber seed) were extremely low in comparison with their own listed prices of 3s. 6d. per oz. (56s. per lb.) for tomato seed and 15s. per lb. for cucumber seed. The various vegetable growers' organisations and private growers affiliated with the Vegetable Growers' Association had indicated their willingness to purchase locally-produced seeds, and desired that seed supplies be brought under their notice.

Rickets in Chickens Caused by Vitamin D Deficiency.

J. K. HUTCHISON, B.V.Sc., Veterinary Research Officer.

RICKETS is a disease occurring in chickens, and is caused by a deficiency in the diet of vitamin D, a food factor necessary for proper formation of bone. This deficiency leads to softness of the bones, resulting in weakness, crippled limbs, debility and death.

Birds in Early Stage of the Disease.

Why the Disease Occurs.

It is known that there are present in foodstuffs certain factors called vitamins which are necessary for life or proper body development. Different foods vary in their vitamin content, some being rich in one vitamin and deficient in another and *vice versa*. Vitamin D is present in certain animal products, notably cod liver oil, milk and eggs, and is unique in that it can be supplied also by certain active rays of the sun (ultra-violet rays).

As this vitamin is necessary for the minerals in the food to be converted into bone, its absence (either in the food or from lack of sunshine) results

* Since contributing this article Mr. Hutchison has resigned from the Department.

in the bones not developing properly, being soft and incapable of supporting the weight of the chick. The ultra-violet rays do not penetrate ordinary window glass, so that chickens whose only source of sunlight is through window glass are liable to show rickets if the ration is deficient in vitamin D.

Age of Birds Affected.

Under conditions prevailing in the poultry industry of Australia, rickets is likely to be seen only in chickens in the first few weeks of life, particularly in the brooding period. Normally the egg contains a supply of this vitamin sufficient to provide the growing chick until it gathers supplies itself either from the food or sunshine, *i.e.*, for about a week or ten days. In chickens from normal eggs, but on a deficient ration and away from sunlight, rickets appears in from eleven to fourteen days.

If, however, owing to lack of the vitamin supply in the laying hens, the eggs are deficient in the vitamin, it follows that the chicks will be unprovided with vitamin from hatching. Under these circumstances, rickets may appear as early as two days after hatching.

Symptoms and Post-mortem Appearance.

Symptoms.—It is usual for a number of chicks to show symptoms simultaneously. The first sign is that an affected chick is noticed to be unsteady on its legs. When disturbed, it runs with a stiff "wabbly" gait, comes to a sudden stop, drops its tail and has a dejected appearance. The appetite is usually unaffected until late in the disease, but many chicks find difficulty in eating owing to softening of the beak and the bones of the head. The beaks are often held open after eating and remain so until death. In some cases the softening of the beaks becomes very pronounced, with the beaks actually crossing and curling over each other.

As the disease progresses the chicks become more dejected, and stand with wings and tail dropped, feathers ruffled, head down, and eyes closed. The body often sways backwards and forwards, so that the head comes nearer and nearer the ground, and finally the chick topples over on its head. Frequently the chicks suddenly run backwards, particularly if disturbed. The leg-weakness increases until the birds are unable to stand for long, and they lie down on their sides or breasts, rising only if disturbed. When lying down they sometimes have one leg extended forward and the other backward. Finally the chicks are unable to rise and death occurs in a few hours.

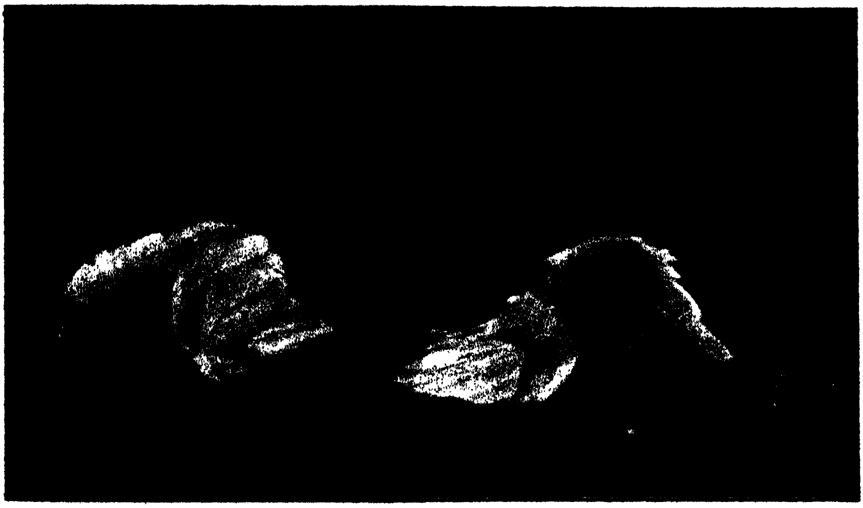
A prominent feature of rickets and one which distinguishes it from other chicken diseases is that the chicks are usually sick from two to three days, whereas in other diseases a sick chick rarely survives twenty-four hours after showing symptoms. This feature, coupled with the softness of the bones and of the beaks are most prominent characteristics of rickets.

Post-mortem Appearance.—The ribs are usually distorted and nodular, and the breast-bone shows varying degrees of distortion ("crooked breast").

The long bones of the legs and wings are soft, and may be readily bent without breaking. They are easily cut with a knife or even with the finger nails.

Treatment.

Chicks affected with rickets should be immediately given an ample supply of the vitamin, either in the form of direct sunlight or as cod liver oil, and good results may be expected from such treatment. Whether the treatment is exposure to direct sunlight or the administration of cod liver oil, an initial dosing of all chicks should be undertaken, giving each chick four drops of cod liver oil by means of a dropper.



Birds in Late Stage of the Disease.

Where chicks cannot be run in the sunlight during the warm hours of the day, as in the case of chicks in battery brooders, pure cod liver oil should be provided at the rate of 4 per cent. added daily to the mash until the disease has disappeared, when the amount of cod liver oil may be reduced to 2 per cent.

It must be borne in mind that, for reasons already stated, exposure of chicks to the light which penetrates ordinary window glass does not provide the chicks with a source of the necessary vitamin.

The presence of minerals in the ration of chickens is equally as essential as that of vitamins for normal bone formation. All rations should contain bone meal at the rate of 1 per cent., but in cases where rickets has made its appearance this amount should be increased to 2 per cent. until all signs of the deficiency disease have passed, when the smaller amount may be reverted to.

Prevention.

Prevention is on similar lines to treatment. It is primarily of importance that the breeding stock should be provided either with direct sunlight or with from 1 to 2 per cent. of pure cod liver oil in the mash. The vitamin is then supplied in the eggs.

When one week old, chicks not in battery brooders should be allowed to run for at least one hour daily in warm sunlit pens adjacent to the brooder house. Especial care should be taken to see that chicks in battery brooders, or where exposure to sunlight is not practicable, should be provided with 2 per cent. of pure cod liver oil in the mash. It is preferable to add the cod liver oil to the mash daily.

As ordinary window glass filters out the essential sun rays, a special type of glass which admits the rays is at times employed. It is rather expensive, and other glass substitutes of the fabric type, which are claimed to be satisfactory, are sometimes used.

CANADA TAKES MORE OF OUR PRIMARY PRODUCTS.

ACCORDING to the Canadian Government's preliminary report on the trade of Canada for the year ended 31st March, 1931, Australia's exports to the Dominion for last year amounted to 4,616,722 dollars as against 4,211,351 dollars for the year 1930, representing an increase of 405,371 dollars.

Details of some of the principal items of Australia's exports to Canada during the last two years are as follows:—

Items.		1930.	1931.
Currants, dried	lb.	3,957,113	3,864,461
	$	454,959	403,510
Raisins	lb.	6,021,826	10,696,170
	$	717,544	1,073,516
Pineapples, canned	lb.	65,892	366,814
	$	3,360	38,215
Fruits, canned, other	lb.	2,664,745	4,162,292
	$	220,581	335,127
Wines...	$	45,201	66,219
Eucalyptus Oil	lb.	16,617	14,205
	$	6,249	6,009
Hides and skins, raw, cattle	cwt.	20,048	21,050
	$	279,469	188,723
Beef, fresh	lb.	1,889,507	284,916
	$	169,838	24,963
Mutton	lb.	4,350,564	1,257,362
	$	534,142	133,131
Butter	lb.	856,912	2,387,840
	$	357,893	750,031
Gelatine	lb.	390,902	471,171
	$	98,905	106,071
Wool, raw	lb.	463,276	762,418
	$	266,057	188,011
Worsted tops	lb.	223,360	469,561
	$	218,686	366,390
Articles used in the manufacture of agricultural implements	$	....	374,053

Poultry Notes.

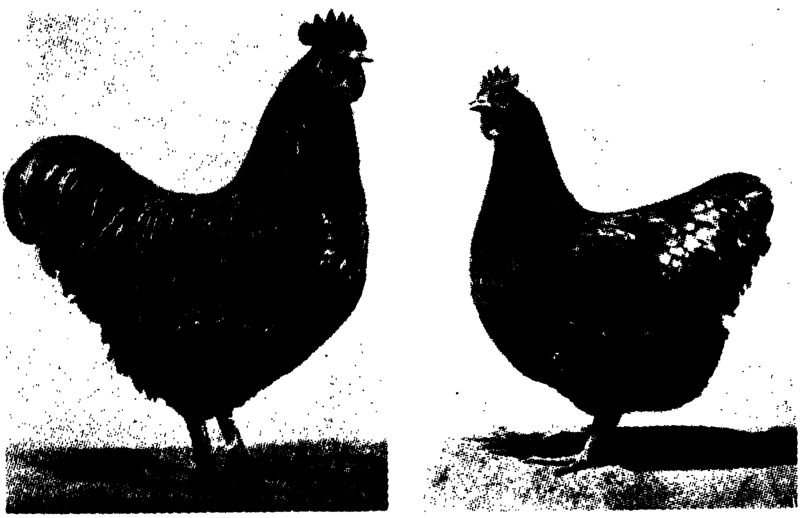
October.

E. HADLINGTON, Poultry Expert.

The Australorp Standard.

AFTER much careful consideration, the Poultry Club of New South Wales has drawn up a standard for the Australorp, and it is hoped that this will result in clearing up the confusion which previously existed with regard to the various types of orpingtons.

In adopting the name "Australorp," the Poultry Club decided to abolish the classes for utility orpingtons, and this procedure has been followed by most of the affiliated poultry societies in the shows held this year. In future, therefore, classes will only be provided for Australorps and Standard Orpingtons.



Standard Birds of the Australorp Type.

The sub-committee of the Poultry Club, before formulating the standard, visited the farms of a number of leading commercial breeders of Australorps, selected a pair of birds conforming to the desired type, had them photographed and then drew up a standard descriptive of the type decided upon. The standard, together with the photographs has been published in the form of a folder and is available from the Poultry Club at a nominal charge.

If the work of the Poultry Club is to be of any value to the industry, commercial poultry farmers who are breeding Australorps will require to familiarise themselves with the standard and type of bird selected and endeavour to

breed in accordance therewith. On many farms where Australorps are kept there is no uniformity in type, and it is only by constant and careful selection of the correct type of birds that evenness in the flocks will be attained.

AUSTRALORP STANDARD.

Type.—Body deep and broad, showing somewhat greater length than depth; breast full and rounded, carried well forward without bulging; breast bone long and straight; back broad, both across the shoulders and the saddle, with a sweeping curve from the neck to tail.

Head.—Finely modelled with skull rounded and full at the back. Beak slightly curved, strong and of medium length, black in colour. Eyes large, prominent and expressive; black with dark-brown or black iris. Face, full, fine in texture, clean, free from wrinkles and overhanging brows; colour bright red. Comb single, medium in size, erect, evenly serrated, and blade tending downwards without touching the neck, texture fine, but not of glace appearance. Wattles medium in size, rounded at bottom, and corresponding in texture to the comb. Earlobes, small and elongated, colour red.

Neck.—Fairly long, fine at the junction of the head, with a gradual outward curve to the back, widening distinctly at the shoulders.

Tail.—Full and compact, rising gradually from the saddle at a somewhat lower angle than the neck; the sickles in the male gracefully curved but not long and streaming.

Wings.—Compact and carried closely without clipping in, the ends being covered by the saddle hackles.

Legs.—Strong, well rounded, and spaced well apart, thighs and hocks covered by body feathering, and almost the whole of the shanks showing below the underline. Shanks and feet (four toes) black, with white soles, and free from feathers or down.

Skin.—White and fine in texture.

Plumage.—Black with lustrous green sheen; feathering soft but close, with a minimum of fluff, only sufficient to cover the hocks.

Carriage.—Erect and graceful, denoting an active fowl, the head being carried well above the tail line.

Minimum Weights.—Cocks, 8 lb.; cockerels, 7 lb.; hens, 6 lb.; pullets, 5 lb.

SCALE OF POINTS.

	Points.
Type	35
Head (eye, 10; face, 5; skull, 5; comb, 5)	25
Plumage (quality and character of feathering)	15
Colour	10
Condition...	10
Legs and feet colour	5
Total	100

DISQUALIFICATIONS.

Any deformity such as wry tail, roach back, crooked breast bone, crooked toes. Yellow or willow colour in legs or feet. Yellow or pearl coloured eyes. Feathering on shanks or feet. Side springs on comb. Red, yellow or white in feathers. Under weight.

Save the Standard Orpington.

Following upon the work just completed in connection with the Australorp Standard, it is essential that the Poultry Club should select the type of birds which conform to the existing standard for Orpingtons and publish illustrations of them in order to induce the breeding of the correct type of birds, otherwise the Standard Orpingtons will soon become a breed of the past. Yet, if they were bred strictly in accordance with the standard which has been in use for years, they could be made a useful dual-purpose breed. As matters stand

at present, no commercial breeder would entertain the idea of adopting the type of birds which are seen in the standard classes at our Shows. There would be no necessity to alter the standard now in use, but merely illustrate to judges and breeders a correct interpretation of that standard.

Branding Poultry.

In view of the wholesale thefts of poultry during recent months, and the difficulty experienced by poultry farmers in identifying stolen birds, the question of branding the birds with an indelible mark should be worth considering. In this connection, it may be pointed out that tattoo branding pliers such as are used for tattooing rabbits are obtainable in Sydney, and could be adapted for branding fowls. Pliers with fixed numbers, letters or designs are obtainable for about 35s., while others with interchangeable characters are more costly. The brand could be placed on the web of the wing.

Housing Experiments in England.

During my stay in England in 1930, I visited the Harper Adams College where the National Institute of Poultry Husbandry is situated, and was interested in the comprehensive range of experiment work being carried out there. Among the various phases of work undertaken was a test to determine the effect of confinement of birds on egg production. The result of this experiment have since been published and have just come to hand.

In view of the controversy which has taken place here from time to time regarding this subject, it was thought that the results would be of interest to readers of these notes, and a lengthy extract from the report is therefore reprinted hereunder.

The Influence of Confinement on Production.

White Leghorns.

The confinement of laying stock in the houses, whether for the winter months only, or as a permanent arrangement (intensive poultry culture), presents problems of management of considerable interest and importance.

In the course of experimental work during the winter of 1925–26, it was found that the egg production of birds confined for the winter months was considerably lower than for those at liberty in grass runs, though all the birds were fed in a similar manner.

In order to gather information on the subject, a second experiment was started. Three pens, each of forty White Leghorns, were used. The houses were identical in construction and equipment, except that two pens had ordinary hopper windows with two 20 in. x 30 in. panes of glass, and the third pen had the woodwork and windows removed as far down as 2 feet from the ground level; the resultant space was covered with wire netting, giving practically an entirely open front.

The rations fed to the birds in the three pens were identical throughout the entire ten months of the experiment, viz. :—

Grain Mixture.—Two ounces daily per bird of 2 parts wheat, 1 part oats, 1 part crushed maize (all parts by weight), fed in the litter in the pen, morning and evening.

Mash.—Two hundredweight of "thirds" (pollard), 2 cwt. maize meal, 1 cwt. bran, ½ cwt. fish meal, fed in dry mash hoppers open to the birds at all times.

Flint grit and oyster shell were placed in open hoppers on the walls of the pens, and during the whole experimental period the birds had access to a daily supply of either fresh cabbage, or, in the spring and summer, fresh grass and clover.

The management of the birds was the only apparent varying factor in the experiment. During the month of October all the birds had access to grass runs. On 30th October two pens of pullets were confined to their pens—one with the ordinary glass and board front, and the other with the specially constructed wire netting or open front. The birds in the third pen were allowed to retain access to the grass run, and acted throughout as the control pen of the experiment.

On 15th March the pullets in the open fronted pen were allowed to go out into the grass run, thus placing them under similar management to the control. Those confined in the pen with a glass front were not allowed to go out, but were divided into two pens, giving nineteen pullets for each pen. This division of the pullets was made with great care, having regard to their winter egg records. Thus four pens were created in place of the original three pens. From 16th March onwards the birds in the fourth pen of nineteen pullets received 2 per cent. cod liver oil mixed in with their grain ration. The other nineteen pullets of the original third pen received the same treatment as during the previous six months. No further changes were made in the feeding or management during the remaining four months of the experiment.

From the results set out in the tables below, it would seem that the cod liver oil was capable of supplying the deficiency which was preventing normal egg production in the confined pen.

In the experiment of 1925–26 already referred to it was found that during the months of February and March appreciable numbers of birds in the confined pens suffered from a form of leg weakness, and that when these birds were dosed with cod liver oil they made rapid recovery. In the later experiment the same trouble was experienced in the confined pen with the glass front. The pullets in the control pen and in the open fronted pen, on the other hand, showed no signs at any time of this type of leg weakness. A small number of birds affected with leg weakness were treated with the ultra violet rays from a quartz mercury vapour lamp, and recovered within ten days, while a further group were dosed with cod liver oil and recovered within about eight days.

TABLE I.—AVERAGE MONTHLY EGG PRODUCTION PER BIRD.

Season and Month.		Glass front.	Glass front plus 2 per cent. Cod Liver Oil.	Open front (unconfined after 15th March).	Control (unconfined).
		Eggs.	Eggs.	Eggs.	Eggs.
Autumn	October	2·7	...	5·1	3·8
	November	8·7	...	9·9	9·6
	November-December	11·8	...	12·8	12·9
Winter	December-January	11·8	...	13·8	14·2
	January-February	10·5	...	14·2	17·0
	February-March	8·8	...	14·8	17·9
Spring	March-April	9·4	16·6	18·3	20·6
	April-May	10·0	15·8	18·9	19·5
	May-June	8·2	19·3	19·3	20·3
Summer	...June-July	6·0	17·5	20·1	19·4
	Totals	87·9	123·3	147·2	155·2

TABLE II.

	Average Body Weight. Pens. 1.	2.	3.	4.	Average Daily Food Consumption	Cases of Rickets.	Mortality.
	oz.	oz.	oz.	oz.	oz.		
Control	52	64	66	65	3·9	Nil.	1*
Open front	50	62	64	63	3·6	Nil.	1*
Glass front	51	65	66	59	3·2	18	2*
2 per cent. cod liver oil	...	...	66	63	3·7	Nil.	1

* Killed for experimental purposes.

TOTAL CONFINEMENT VERSUS FREE RANGE.

Two pens each of seventy-six White Leghorn pullets were compared. Pen No. 1 was confined throughout the year and given one pint of tested cod liver oil in each 100 lb. of scratch feed. Pen No. 2 was unconfined and did not receive any cod liver oil. The ration used was as follows :—

Grain mixture (fed at the rate of about 12 lb. per 100 birds daily).—Two parts (by weight) wheat, 1 part oats, and 1 part whole maize.

Dry Mash (occasionally fed as wet mash).—56 lb. "thirds," 56 lb. maize meal, 28 lb. bran, and 14 lb. meat meal.

Mineral Mixture.—55 lb. sterilised steam bone flour, 20 lb. ground limestone, 20 lb. common salt, 5 lb. sulphur.

Free access was given to grit, oyster shell and water. Some green food was given to both pens.

Morning lights were given from 4 a.m. about 1st November, to about the middle of March. The result favoured the unconfined pen, particularly in the period covering the summer months.

TABLE SHOWING PERCENTAGE EGG PRODUCTION.

Period September-August.	Pen No. 1 Confined (cod liver oil).	Pen No. 2 (Unconfined).
	per cent.	per cent.
Second six months average ...	53·48	63·52
Twelve lunar months average ...	47·81	51·44

The margin over food cost for the twelve lunar months was £58 6s. 6½d. in the case Pen No. 1, and £65 2s. 2½d. in the case of Pen No. 2.

USE A COMPLETE MANURE FOR ASPARAGUS.

THE first yields of an asparagus manurial trial conducted in co-operation with Mr. H. Eastwood, of Tascott, suggest that the complete manure P16 (three parts superphosphate and one part each of sulphate of ammonia and sulphate of potash) is the most profitable to apply to young beds.

The experiment, which was commenced in 1929, is located on a light sandy loam soil. Prior to planting on 30th May, 1929, decayed seaweed and cow manure at the rate of 28 tons per acre were worked into the soil in the bottom of the trenches and the several artificial fertilisers to be tested then spread along the rows and mixed with soil. In the month of August, in the years 1930 and 1931, liberal dressings of seaweed and cow manure were again given, and the plots received the same dressings of artificial fertilisers as just prior to planting.

The first cutting was made in the spring of 1931. The plot to which the complete fertiliser P16 had been applied at the rate of 936 lb. per acre produced the greatest yield, equal to 1,344 bunches per acre, valued at £82 18s., while the plot treated with superphosphate alone at 560 lb. per acre yielded 1,056 bunches, valued at £65 2s. per acre, the increased value of the yield from the complete manure plot over the superphosphate-treated plot being £17 16s. per acre, obtained at an additional cost of only £2 15s. per acre.

The plot which received superphosphate alone gave practically no increase in yield over the plot which did not receive artificial fertiliser. Though it has always been assumed that asparagus needs only superphosphate, this first cutting indicates that its use alone is not profitable.

The plots which received P14 (three parts superphosphate and one part sulphate of ammonia) and P15 (three parts superphosphate and one part sulphate of potash), each at 747 lb. per acre, also showed profitable increases over the plot which received superphosphate alone.

The Farmer's Library.

"Wool Quality": A Review.

From the Empire Marketing Board we have received a copy of Dr. S. G. Barker's book, "Wool Quality." It is claimed that this book is the first attempt to record in English the present position of our knowledge concerning wool fibre as regards quality. The influence of biological, chemical and physical factors on the quality and manufacturing properties of wool is discussed from both practical and scientific standpoints. Much consideration is given to the description of modern technique of fibre measurement and to methods for the determination of elasticity, sulphur content, structure as revealed by X-rays, etc. A full description is also given of the use of modern scientific methods for the determination of the structure of a fibre, including the effects of such structure upon its subsequent manufacturing performance. The book also deals with those factors, external to the sheep and to the breed, which deteriorate the quality of wool, such as the use of tar, black hairs in the fleece, etc.

An extensive bibliography is appended, and the book is very well illustrated.

"Wool Quality" should prove an excellent reference book for the practical man, the teacher, the student, the research worker, the manufacturer, and the farmer.

"A Manual of Beekeeping."

We have received from Messrs. Edward Arnold and Co., publishers, London, a copy of Mr. E. B. Wedmore's book, "A Manual of Beekeeping for English-Speaking Beekeepers." This work, which is really a compact encyclopaedia on the subject, provides a comprehensive survey of up-to-date beekeeping methods, and we doubt if we have seen a more complete single volume. The arrangement of the subject-matter makes ready reference to any particular subject contained in its 413 pages a very simple matter. The price of the book in London is 15s.

"Commercial Cucumber Culture": A Review.

The growing of out-of-season cucumbers in glass houses might prove a hazardous undertaking, financially, in a country like Australia, where cucumbers can be grown out-of-doors every season of the year in one State or another. There may be exceptional cases where it would be a paying proposition to cater for a local market. Even then it would be necessary to look to overseas experience for guidance as to the growing of cucumbers under glass. A booklet covering the subject very completely is James W. Craig's "Commercial Cucumber Culture," published by Ernest Benn, Ltd., London, from whom our copy was received. The book is priced at 2s. 6d. in England.

CONTENTS.

Agricultural Gazette of New South Wales.

Soil Erosion.

CONTOUR DRAINS WILL CONTROL IT ON WHEAT LAND.

L. JUDD, Manager, Temora Experiment Farm, and H. J. KELLY, Manager, Cowra Experiment Farm.

IT will be readily conceded that throughout a large portion of our most favourably-situated wheat areas, soil erosion has become a problem demanding serious consideration and immediate attention. Already thousands of acres of valuable land have become damaged beyond redemption as far as cultivation is concerned, and the effects of soil erosion are fast reducing the value and carrying capacity of a large area of grazing land.

On every hand one sees paddocks which a few years ago could be cultivated throughout their length and breadth, but which to-day are hopelessly scoured out, necessitating working in sections and thus increasing cost of production at a period when economic conditions demand the reduction of all costs to a minimum. Even where light scouring has taken place the damage to cultural, and particularly harvesting, machinery is heavy and represents a repair bill that can by no means be lightly treated, while delays at harvest time cause financial loss which it is hard to estimate. Many farmers know only too well of the ruination of steady, reliable horse teams from continued stumbling and fright when stripping paddocks showing but mild channels. Fencing, too, has suffered; it is a common sight to see damage to fences sufficiently great to place the matter of salvage beyond hope, thereby incurring expense for new netting, wire and posts, while the gullying and burying of fences has in turn meant increased expense in the direction of rabbit eradication.

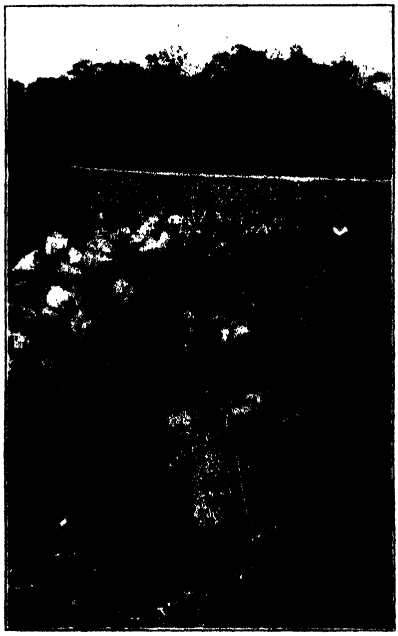
The seriousness of the problem is more readily appreciated when it is realised that erosion results in increased cost in practically every direction, and at the same time a gradual but sure diminution of the returns from the property.

The Causes of Erosion.

Land in the virgin state is protected from erosion by the timber that grows on it. This covering not only ensures a gradual flowing of the excess water, but at the same time materially increases the water absorbing and holding capacity of the soil by supplying leaves, bark, etc., for the formation of humus. In the process of converting our wheat lands to agricultural use, the timber was destroyed, and then the system of cropping adopted gradually led to the depletion of the stores of humus and organic matter. With the loss of humus there followed the diminution of the water absorbing and retaining capacity of the soil, and of its adhesive qualities, and consequently of its fertility. These facts have been brought before the notice of agriculturists, first by the reduced yielding capacity of the soil, and later by the disastrous results of soil erosion. Temporary alleviation

from the former was obtained by the adoption of systematic cultural operations, and the production of what is known to-day as "ideal fallow." Though through these improved methods it was found that the yielding ability of the soil was materially improved, the remedy contained the weakness that the continued working (in some cases, excessive working) led to a further loss in organic matter, affecting the physical condition of the soil, and later hastening the process of erosion.

Once erosion has commenced it is found that there is a rapid depletion of the fertility of the soil, at a rate far exceeding that possible by cropping. Unfortunately erosion causes a considerable amount of damage before it is observed, and the loss which results from this sheet erosion comprises the finer particles of the soil together with humus—the richest portions of the soil.



The Result of an Attempt to Check Erosion by placing Stone in a Gutter.
The water has cut a new track around the obstruction.

The damage by erosion has been accelerated by careless methods of cultivation. Paddocks obviously requiring to be ploughed in lands have been ploughed round and round with deep "clean-outs" left at the corners; drilling and cultivation have been made with the slope instead of across the natural fall of the ground, while minor washings, through neglect have been allowed to assume alarming proportions, culminating in the ruination of the paddock. Some of these may seem minor points, but successful prevention of erosion demands attention to these details.

Methods of Controlling Soil Erosion.

Analysing the position, we find little hope of correcting the trouble by the restoration of organic matter alone. The position demands the immediate arresting of, and definite control of the water flow through the paddocks, to be followed by farming practice which will ensure a building up of the organic matter content of the soil. It is essential for successful permanent results that drainage and restoration of organic matter go hand in hand.

The adoption of suitable rotations, grazing of fodder crops, resting of paddocks by placing them under pasture, and a diversified system of farming, all tend towards the restoration of humus and bringing the soil back to that condition which is essential for maintaining the yielding ability of the

soil. The higher the organic matter content of the soil the greater the water absorbing and holding qualities, and the richer the soil in plant food constituents.

The Use of Contour Drains.

Surface drainage as a means of preventing erosion is by no means new, but experience has shown that efforts in the past have frequently proved fruitless due to the incorrect methods of procedure adopted. The tendency in the past has been to rely on the judgment of the eye to run out a drain, and the result has been, in many cases, that the remedy has proved worse than the complaint, the drains made having become forerunners of gullies which have permanently ruined the paddock for cultivation. In other cases the drains proved inadequate to carry the water and were more or less useless for the purpose constructed. To rely on judgment only in the construction of drains is the surest way to court failure.

The fallacy that "ploughing in" channels will arrest erosion has long since been exploded; experience has shown that the practice merely accentuates the trouble. Similar results have followed the use of straw, etc., in the small channels; one finds that the water cuts another track equally as bad or worse than the one filled in.

Experience in America and at Cowra Experiment Farm has shown that the only successful method of dealing with soil erosion is the use of broad base contour drains. These consist of low banks of earth across the slope to arrest the flow of surplus surface water, and wide sloping drains on the upper side of the banks to collect the water and convey it slowly to a suitable outlet. The gradual slope of the drain permits of the maximum absorption of the surplus water, thereby making use of water which would otherwise be a destructive agent.

The banks vary from 1 to 1½ feet in height and are approximately 9 feet wide, with the open drain of similar width. Where possible, the banks should be of such a height and nature as to allow of the passage of teams across them, since there is then no loss due to uncropped land, and there is no idle ground to harbour weeds, etc.

Where possible the outlet for the drain should be on to a road, permanent pasture paddock or natural water course. If an outlet of this class is not available, a wide drain will have to be made into which the water can flow. The laying down of such a drain to lucerne or Subterranean clover, where suitable, would materially aid in the prevention of washing; at Temora Experiment Farm surplus water from the drains constructed in a cultivation paddock was turned on to an adjoining lucerne paddock, and a remarkable increase of growth in the lucerne followed the watering received by this means.

Essential Points for Consideration.

The aim is to convey the water away with a minimum of velocity to prevent the soil particles from being carried away and damage done to the

bank of the drain, and there are three essentials if this objective is to be achieved:—

1. The correct grade must be obtained when constructing the drain.
2. The drain and bank must be of ample proportions.
3. The vertical distance between the contour drains must be in direct accordance with the area and the slope of the land to be drained.

Experience has shown that a fall of 1 inch in 16 feet 8 inches, or ½ per cent., will give the requisite grade to carry water slowly and without damage to the drain, other things being equal.

Capacity of the drain and the dimensions of the bank will be governed by several factors, viz., (*a*) the area which the contour drain has to cater for; (*b*) the slope of the area; (*c*) the type of soil; (*d*) the length of the drain.

Other things being equal, it naturally follows that the greater the distance between drains (the greater the area to be drained), the greater the body of water to be catered for; hence the farther drains are apart the greater must be their dimensions. Further, the greater the slope of the land the greater will be the velocity of flow of surface water, both over the terrace and in the drain. The drains must be of ample capacity to hold and convey the water received. If for some reason, such as the lack of a grader or equipment, one is unable to obtain the height of bank required, consideration must be given to the enlargement of the drain and reduction in the area to be drained to compensate for the reduced height of the bank.

The type of soil will have an influence, as all soils do not absorb water to the same degree. Sandy soils and light loams have a greater absorption capacity than clay soils; the latter will be found to give a far greater measure of "run-off" than those previously mentioned, and this aspect must be considered when laying out contour drains.

As regards the length of drain, it must be realised that, with a drain with only a slight fall towards the outlet, there must automatically be an accumulation of water along the length of the drain which must be catered for; therefore the longer the drain the greater the capacity that must be allowed for in the construction of the drain. Where possible, drains should be of short length, as the shorter the drain the less likelihood of the water breaking over the banks.

When considering the ratio of surface to be drained to the size of the drain, it must be realised that the size of the drain and the height of the bank are limited to a certain extent by the machinery available for construction and by the fact that cultural implements must work over the banks.

Planning the Contour Drains.

Having given consideration to the maximum height of the bank and size of the drain, the distance of the drains apart must be determined.

The absorption capacity of the soil and probable length of drain having been assessed, the distance apart will be decided by the degree of slope of the land. This can be gauged where the slope is regular by using a straight

edge 16 feet 8 inches in length; place one end on the ground on the uphill side, and, placing a spirit level on the centre, raise the lower end of the straight edge until the level shows it to be horizontal. The distance from the ground to the raised end of the straight edge, multiplied by six, gives in feet the fall in 100 feet, or the percentage fall.

Another method is to measure from a given point, 100 feet downhill, and insert a peg to mark the distance; then at the given starting point mount a spirit level "dead true" horizontally at a convenient height (of say 5 feet) and pointing down the slope towards the peg. Then take a sight along the top of the level on to a staff marked in feet and inches, and held by an assistant at the peg. This reading, less the height of the spirit level above ground level at the starting point, will give the fall in the 100 feet.

Erosion Controlled by a Contour Drain.
The figure in the foreground marks a spot where a channel 3 feet deep had previously been washed out.

It is not possible to lay down any definite data in regard to the exact vertical distance between drains, but under average conditions and generally speaking a vertical distance of 9 feet between drains will prove satisfactory, with minor alterations to suit peculiar and local conditions which exert a controlling influence. On badly eroded country 6 feet vertical distances may be necessary. Where the slope is gradual, say from 3 to 6 per cent., the banks will not require to be as close together as where a steeper gradient exists, and drains 3 chains apart have proved satisfactory. Consideration must be given to any accumulation of water from grass paddocks or other source situated on higher land adjoining.

Having decided the vertical distance the drains are to be placed apart, the location of the starting points of the various drains may be quite easily determined by the use of the spirit level as just previously described, but in this case the staff is moved by the assistant either up or down the slope till the correct reading is shown on the staff.

(To be continued.)

Recording Disease in Crop Plants.

S. L. MACINDOE, B.Sc.Agr., Assistant Plant Breeder.

Part 1.—Smuts of Cereals.

PLANT diseases annually take a heavy toll of crops throughout the Commonwealth. A considerable amount of work is consequently being undertaken by pathologists, plant breeders and agronomists in evolving resistant varieties or in devising means of disease control by special treatments. Extension workers and farmers are also sometimes concerned with estimating crop losses due to disease.

It is therefore desirable that there should be some easily applied method of determining reduction in yield caused through disease. The adoption of a uniform method of recording percentage infection and percentage reduction in yield would allow investigators in different localities to take greater advantage of results obtained by other workers, who would know, for example, exactly what was meant by a variety of wheat being 30 per cent. infected with flag smut and 10 per cent. reduced in yield.

Flag Smut.

Since flag smut (*Urocystis tritici* Koern) is probably the most important disease of wheat in Australia, suggestions for recording susceptibility to that disease will be dealt with first.

The method frequently adopted in recording flag smut infection in nursery rows is to pull the infected plant and express the percentage infection as a percentage of the total number of plants in the row. This figure does not necessarily express the amount of damage done to the variety, which is ultimately the most desirable basis for determining relative resistance or susceptibility within varieties or treatments. It is true, however, that very often the most resistant varieties, as estimated on a percentage infection basis, are also those in which the infected plants tend to show least damage as the result of infection.

Varieties which are highly susceptible produce mainly dwarfed and stunted plants, which are classified as "wholly" infected. It has frequently been observed that varieties, such as Nabawa, which show a degree of resistance, tend to produce a higher proportion of plants which are "partially" infected; that is, plants in which perhaps only a few late tillers are infected, while the remainder of the plant may produce grain normally. A similar difference in reaction has been noted as the result of soil treatments. For example, it was noticed in a fallowing experiment that the percentage reduction in yield from flag smut was smaller in a crop sown on "long fallow" than in that sown on "short fallow," although there was no apparent difference in actual percentage infection. Thus, while it

may be desirable to calculate percentage infection, it is perhaps still more important to record a figure indicating percentage reduction in yield. For accurate work yield should be taken from replicated field plots, but for most purposes the following method is very easy to apply, and is sufficiently accurate.

Plants are space-planted 3 or 4 inches apart in the row. As maturity is approached the number of plants in the row is counted, all plants showing a trace of infection are pulled up and placed at the end of the row. The percentage reduction in yield is then calculated by throwing each of the infected plants into one of the six classes, 0, 20, 40, 60, 80, and 100 per cent. reduction in yield. By multiplying the number of plants in each class by the percentage infection, summating and dividing by the total number of plants, the percentage damage is rapidly and easily calculated thus:

Of a row containing 33 plants of Clarendon—

3 plants were 100 per cent. infected	300
2 ,, 80 ,, ...	160
2 ,, 40 ,, ...	80
	540

540 divided by 33, *i.e.*, the number of plants in the row = 16 per cent reduction in yield.

A still more rapid calculation can be made by representing the five classes, 0 to 100 per cent., by the figures 0, 1, 2, 3, 4, 5. Multiply the number of plants by the class figure, summate and multiply by twenty, and then proceed as before.

3 plants multiplied by 5 = 15
2 ,, ,, 4 = 8
2 ,, ,, 2 = 4

$$27 \times 20 = 540$$

$$\frac{540}{33} = 16 \text{ per cent. reduction in yield.}$$

Two errors might arise in using this method—

(1) Inaccuracy in estimating the percentage damage of each plant. With experience this error is considerably reduced.

(2) The increased vigour of plants adjacent to plants which have been dwarfed early in the season may compensate to some extent for losses in yield. Where observation would indicate this to be the case a slight correction may be necessary. This could be based on the number of plants taking advantage of the reduced competition and the degree to which the yield of these has been increased. For most practicable purposes these sources of error can probably be ignored.

Loose and Covered Smuts of Wheat, Oats and Barley.

The above method of estimating reduction in yield can be used equally well in the case of other cereal smuts. Frequently, however, this is obtained, especially in the case of bunt, by cutting at random two or three lots each

of about a hundred heads and reckoning disease damage on the basis of percentage of heads infected. This method appears to have no advantage over that outlined above, which gives the percentage of plants infected as well as the reduction in yield.

In applying a genetic interpretation to economic breeding work, the above method can also be used to advantage. For this purpose the number of percentage classes can be increased to fit the material being analysed. Though the use of this method in genetic studies is undoubtedly open to criticism on the basis that the plant must be considered as the Mendelian unit, it is felt that it is sometimes more important to draw an accurate picture of the inherent characters of the varieties used in crosses than to insist on interpreting ratios strictly on a factorial basis.

In the estimation of crop damage from smuts a method similar to that outlined can also be used with advantage. By studying a sufficient number of small plots taken at random over the area a very reliable figure can be obtained for the whole plot.

(*To be continued.*)

Purchase of Stud Rams on Terms.

The Minister of Agriculture (the Hon. Hugh Main, M.L.A.) states that the Government has decided to make available an amount up to £50,000 to enable small flock owners to purchase stud rams on terms. The Minister states that, owing to the decline in wool prices within recent times, many small holders have found it an extremely difficult matter to finance their operations. As a consequence, many of them have either refrained from purchasing rams for maintaining the standard of their flocks, or have procured rams of inferior type, thus jeopardising the quality of the clip.

It is of prime importance that the quality of Australian wool should be maintained at the highest possible standard, and with a view of assisting in this direction, the Government has decided to make provision whereby owners of small flocks who are not in a position to purchase rams may be able to obtain suitable animals on extended terms. The scheme is to apply to owners of flocks of up to approximately two thousand breeding ewes, and the amount to be advanced to any individual settler will be limited to £40 plus freight (if any). Repayment of the advance, together with interest at the rate of 4 per cent. per annum, will be spread over a period of three years, one half the amount to be repaid at the end of the second year and the balance at the end of the third year. The selection and purchase of all rams under the scheme will be arranged by officers of the Sheep and Wool Branch of the Department, so as to ensure that only rams of a suitable type are distributed.

This scheme, in conjunction with the sheep competitions which were so successfully inaugurated this year, should play a most important part in improving the quality of the wool clip. The *Farmer and Settler* newspaper, which co-operated so actively in the launching of the sheep competitions, has also figured prominently in the origination of this scheme.

Application forms and further details are obtainable from the Rural Industries Branch of the Department.

Insect Pests of Rice Crops on the Murrumbidgee Irrigation Area.

P. C. HELY, B.Sc.Agr., Assistant Entomologist.

COMMERCIAL rice-growing has only become an established industry in Australia camparatively recently, and it is not surprising that no very appreciable trouble has been experienced from insect pests, but with the rapid expansion of the area under the crop certain pests have begun to make their appearance. At the present time the insect pests of rice on the Murrumbidgee Irrigation Area are all native insects, but it would appear that with at least one of these pests rice is gradually becoming a preferred host plant. Whilst the actual damage caused by the depredations of the pests of rice over the period of commercial rice culture on this Area has been inappreciable, the loss on some farms has, in the last few years, been of some definite significance.

The following insect pests, in the order of their relative importance, have been recorded:—Rice beetle (*Laius femoralis*), grasshoppers (*Chortoiceles terminifera*), rice stem borer (*Phragmatiphila* sp.), a caddis fly, pumpkin beetle (*Aulocophora olivieri*), flea beetle (*Haltica ignea*), and a species of *Neuropteron*.

The Rice Beetle (*Laius femoralis*).

This blue and orange coloured Melyrid is by far the most important pest of rice on this Area, and during the past season was present on the majority of the rice farms, though the damage occasioned was often inappreciable.

Injury is caused by the adult beetles, which are active insects that fly readily when disturbed. The attack commences in early February and continues well into the month of March, depending on the stage of maturity of the grain in the crop. The rice appears to be in its most attractive condition when the grain is in the "milk" stage shortly after setting, but remains attractive right through the "dough" stage, and even when the grain has commenced to harden the beetles will often be seen in the panicles feeding on chalky grain. This year the insects were also in some crops in the flowering stage, feeding on the anthers and pollen, and also on the ovaries. The glumes or "husks" may be pushed apart by the beetles working the mandibles along the suture at the overlapping margins, and then finally, with the body holding the glumes apart, the beetles feed on the developing ovary inside. It often happens that the glumes, closing firmly on the insect, prevent its escape, and the beetles are found dead, wedged between the husks. If the husks cannot be forced apart, the insect may gnaw out the side of the glume and feed on the exposed grain within. In other cases the whole side of the grain may be eaten away.

Infected heads are characterised by the whitened grains intermingled with the normal green grains, and on close examination the gnawed grains can be seen. Heads attacked by birds such as sparrows, finches, etc., often

present a somewhat similar appearance, and some of this type of damage has been ascribed to the beetle, especially as it occurs only along the edges of the crops. As the rice matures many of the affected grains usually fall from the panicles, leaving only the skeleton of the head. Such heads remain stiff and upright in contrast to the normal uninfested heads, which bend over with the weight of the maturing grain.

Where a heavy growth of barnyard grasses is present, it appears that the insects are attracted primarily to these weeds, and from thence extend their operations into the crop, working in from the boundaries. It seems definite, however, that barnyard grass, while a preferred host plant, has no special significance in the life history of the pest, nor is it essential that this weed be present in rice paddocks for the crop itself to be attacked.

The infestation by this insect is usually characteristic in that the damage is progressive from the margin of the crop, and though it sometimes happens that the beetles are scattered through the crops early in the season, feeding on the flowers and grain, such crops show no evident injury, indicating that the damage, unless concentrated to such an extent as to make stripping unprofitable in the infested sections, is of little relative importance. The injury ranges from small isolated sections infested along one or two boundaries for a few feet into the crop, up to extensive areas penetrating up to 2 chains into the bays along certain boundaries.

This insect is a native species, which in the adult stage normally feeds on the flowering organs of sedges, rushes, and aquatic *Gramineae* of the millet type, and it is to be found feeding on such vegetation in numbers in billabong swamps and along rivers. The adult beetles are long lived, and over-winter in weeds and rubbish, but little is known at present of the complete life history. Fertilisation takes place during late March and April, the males dying shortly after. Practically all specimens collected after the cooler weather has set in are females. Egg-laying probably takes place in the spring, gravid females being collected in August.

From the data available and the knowledge now gained in relation to the habits and methods of attack by these insects, it is considered that arsenical or fluosilicate dusting of the marginal and check bank growth in early February, when the grain is in the milk stage, should, where necessary, prove effective and economical in reducing the damage caused.

Grasshoppers (*Chortoicetes terminifera*).

Some injury has been sustained in late-sown rice crops owing to the winged swarms of grasshoppers in early December, where the water was applied somewhat late.

Rice Stem Borer (*Phragmatiphila* sp.).

Whilst not of any actual importance at the present time, the rice stem borer, which has been recorded here for the past few years, shows considerable seasonal fluctuation, and during the 1930-31 season was in evidence to some small degree in the large majority of the crops examined, both on the Yanco and Mirrool sections of the Area.

The presence of the larvae of this noctuid moth seems to be more or less associated with the occurrence of the barnyard grasses, which act definitely as host plants, and are vigorously attacked by the borer. Rice, however, is preferred as the food plant of the larvae, and when caged with both plants under insectarium conditions they show a definite preference for the crop plant. Cumbungi (*Typha* sp.), a troublesome weed of rice lands, may also act as a host plant for the borer.

There are apparently two broods per year, but it is unlikely that the second one is more than partially developed. Moths of the first brood are emerging from the beginning of March to early April, and these give rise to the grubs of the second brood, which apparently over-winter in this condition. The larval stage of the first brood is of a duration of about twenty-five days, the feeding period being shortened in the hot weather.

The attack apparently commences just about the time when the panicles of the early plants are being extruded from the enclasping sheath. The eggs are laid in small groups of about half a dozen on the lamina, and the larva on hatching out makes its way down the leaf and passes between the auricles, feeding on the surface tissue of the inside of the leaf sheath where it enclasps the stem. From this position it makes its entry into the main stem, where it feeds until the central main inflorescence is destroyed. Entrance is effected at the base of the stalk of the inflorescence, the larva boring through the side of the stem and tunnelling inside. In many instances it then leaves this stem and attacks another.

The larvae, when fully grown, pupate in the leaf sheath cavity, or in the space previously occupied by the developing inflorescence. The pupa is of the typical noctuid type, *i.e.*, forming no cocoon and pupating in the naked condition. The pupal stage occupies from twelve to twenty-one days, with the average of fourteen under favourable conditions and temperatures. The moths on emergence are very sluggish, and probably do not fly far in the crop.

Infestation appears to be heaviest in the centre of the stools. Counts of individual stools attacked by the borer have shown as high as 80 per cent. of the stems infested, but these stools are only found scattered occasionally through the crop. Normally only one grub is found in each stem, but two have occasionally been seen. Under insectary conditions, cannibalism has taken place when more than one larva has obtained entrance to the stalk. The damaged plant is characterised by the empty white panicle in which no grain is set, and these "whiteheads" are very noticeable in the field. Often only the tips of the inflorescence are seen protruding from the bleached sheath, and on opening such a stem the cavity is seen to be filled with grass and vegetable detritus.

The important feature of the control of this insect is the parasitism exercised by two species of wasp. These parasites are external in their nature, and prey on the larval stage of the borer. In all cases where the borer was present in the crops investigated during the season 1930-31 parasitism was noted, and up to 90 per cent. of the individuals in some

crops were parasitised. In caterpillars found parasitised by the more prevalent species of wasp, as many as five wasp larvae have been found feeding on the one host. These hymenopterous grubs pupate in the remains of the borer, and the grey, cigar-shaped cocoons may be seen attached end to end inside the tunnel of the borer in the centre of the stem. This parasite over-winters in the pupal stage within the rice stem.

At present the rice stem borer is of little importance, and no direct control measures are necessary, but any efforts directed at the suppression of weed growth and the destruction of old rice stubble should have the effect of reducing the numbers of the pest.

The scarcity of the rice stem borer in crops this season is probably directly due to the controlling influence exerted by its parasites.

Other Pests.

Some minor damage in rice crops was caused during December, 1931, through the action of the larvae of a species of caddis fly (*Trichoptera*) in chewing through the stems of the young, newly-germinated rice. These larvae encase the abdomen in small lengths of hollow straw, and move about in the mud in the rice bays, destroying the plants by nipping them off just above the roots. The total damage was, however, quite small.

Another factor responsible for some little harm to rice crops early in the past season was the deposition of egg masses on the young leaf blades by a species of *Neuropteron*. These gelatinous egg masses appeared like a soft scale on the laminae, and plants so infested showed definite ill effects. Incidental pests which have been recorded feeding on the grain in the panicles to a limited extent are the pumpkin beetle (*Aulocophora olivieri*) and the black flea beetle (*Haltica ignea*), but these have not assumed any commercial significance.

Register Your Bees.

Reports have reached the Department that a number of persons are keeping bees without having taken steps to register in accordance with the provisions of the Apiaries Act, and in other cases it is alleged that, contrary to the requirements of the Act, bees are being kept in other than properly constructed frame hives. A person guilty of either of these offences renders himself liable to a penalty of up to £20. No charge is made for registration, and a form for the purpose can be obtained on application to the Under Secretary, Department of Agriculture, Sydney. Once an apiary has been registered it is not necessary to renew the registration.

Persons who have neglected to comply with the requirements of the Act are advised to attend to the matter without delay. Two inspectors have recently been appointed for this season, one for the northern district and one for the southern district, each to control the adjacent portion of the western bee-keeping district. It will be their duty to report any cases where the provisions of the Act are not being observed.

Cauliflower and Cabbage Seed.

Nothing Better than Properly Raised Local Seed.

JOHN DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

In this series of articles on the production of seeds of vegetable crops, Mr. Douglass has already dealt with tomatoes, cucumbers, onions, parsnips, carrots, and watermelons, and the many arguments advanced in favour of the local production of seeds of the foregoing crops apply with at least equal force to the production of cauliflower and cabbage seed.

Cauliflower Seed.

THE cauliflower is one of the most popular vegetables placed on the New South Wales market, and the average price realised by growers over a number of years compares more than favourably with that returned by perhaps any other vegetable crop grown on such an extensive scale. Cauliflower growing demands close attention to detail as regards cultural methods, however, while climatic conditions also play a very important part. As in the case of early tomatoes, the growing of cauliflowers is a specialised undertaking, and the grower who studies the subject and grows the crop year after year will obtain the best results.

A Cauliflower Plant in Flower.

The Importance of Good Seed.

The factor which perhaps makes for greatest success in the growing of cauliflowers under ordinary conditions is the seed. All growers, especially those who do not raise their own seed, have experienced failure at one time or another, due to no other cause than unsuitable seed. Inexperienced growers are unable to decide which variety to grow or where to obtain good seed. The saving of a few shillings when purchasing seed is false economy. It is much better to buy the best seed and endeavour to raise each seedling in the proper manner.

Field experiments conducted at Windsor, Maitland and elsewhere have shown that correctly selected and properly raised local seed gives the most satisfactory results in a majority of cases. It is always a wise plan, however, to test out new introductions on a small scale, for in this way it is often possible to select suitable new varieties.

That growers can raise their own seed successfully is evidenced by the fact that for a number of years past several growers on the coast, where the climate is not ideal for cauliflower production, have grown their own selections of cauliflowers, notwithstanding the poorness of the sóil. It must be borne in mind, however, that unless attention is given to every phase of seed production failure will invariably result.

The Common Method of Raising Seed.

The most common procedure in the raising of cauliflower seed is to concentrate on a few rows along the side of the field. Only the very best types should be allowed to mature with the idea of producing seed. Care should be taken to destroy plants with curds unsuitable for market; it will be found that these run to seed quickly and will readily cross-pollinate, rendering the resultant seed useless. As the cauliflower is cross-pollinated by insects, it is advisable to have the seed plot at least half a mile from any other crop belonging to the same family of plants. In the case of different varieties this point is of no importance if they flower at different times. The common plants belonging to the cruciferous family are cabbage, rape, swede, turnip, brussels sprouts, kale and kohl rabi.

Practical experience has demonstrated that up to three varieties can be selected on the one farm, provided they mature at different times. It is the usual practice for large growers to plant three varieties, maturing at four, five, and six months (or later), with the idea of not having all three crops coming in at the one time.

Another method of raising cauliflower seed is to work through the crop, selecting the most suitable plants and then transplanting them to a convenient position. This procedure is only successful when ideal conditions are experienced at transplanting time, for even under the best conditions the plants receive a severe shock owing to their size and to the number of roots which are unavoidably injured during the transplanting.

If it is desired to make some special individual selections, the plants should be covered with mosquito netting to prevent cross-pollination by

insects. Pollination of the flowers may be carried out by hand or by placing flies inside the netting cage. Bees are not as suitable as flies, as once they find themselves imprisoned in the mosquito netting they devote the whole of their attention to trying to escape rather than to the work of pollinating the flowers. The seed from these selected plants should not be mixed, but should be planted separately in adjacent rows in order to facilitate the making of comparisons. Further selections should be made from these rows, while the majority of the plants are allowed to run to seed in order to produce a stud bulk. Rigid culling of all unsuitable types should be carried out before the plants flower. By this method of selection, improvement in type, quality, and uniformity as to date of maturing will be obtained.

Some Points in Selecting.

In the selection of the different varieties a fixed ideal must be aimed at. This necessitates a study of market requirements, quality, and defects of the various types. Attention has also to be given to varietal characteristics as well as to any noticeable variation. A working knowledge of the chief diseases and insect pests is also most valuable.

In selecting individual plants in a crop for the purpose of seed production the first objective should be uniformity as regards quality, type, maturity, and disease resistance. No matter how near perfect any individual plant appears to be, unless it is uniform as regards its main characteristics with the whole of the selected plants it should be discarded. Particular attention should be paid to date of maturity; aim always at selecting plants that mature at the same time. The selection should be made when the curd is at the right stage to cut, for if there is any delay it will be found that the curd becomes over-mature very quickly, and a false impression may be gained as to what the plant looked like when at the correct stage for harvesting. Another point is to select plants that are well covered with leaves, as these are usually of better colour and possess a greater degree of resistance to frost, rain, sun, and other mechanical injuries. The curd, or white, of the cauliflower should be perfectly white, very compact, free from blemish, and should be well grown and developed right around underneath towards the base of the leaf. This feature not only adds to the appearance of the head, but also gives a more weighty product. Curds that have noticeable defects, such as "riciness," and "fuzziness," or plants that have leaves growing up through the curd, or in which the curd is spreading, should be avoided. Plants with plenty of leaf, providing the curd is of sufficient size, should be given preference to sparsely-leafed plants. Discard plants showing symptoms of any disease, discolouration of the leaves, or any points indicating that the plant has been crossed with other crucifers.

Harvest the Seed Before it Sheds.

An inexperienced grower will be disappointed more or less with the behaviour of the plants after selection. It should be remembered, however, that the selection was made when the plant was at the stage when it was most valuable commercially, and its after-growth, provided, of course, it is

Furriness or Fuzziness in a Cauliflower.

A Cauliflower Showing Riciness.

healthy, is of no importance from the point of view of selection. Soon after the plant passes the stage at which it should have been cut, it will be found that the curd becomes over-mature and opens out, later forming up flower buds. The true flower (a yellow, four-petalled one) then appears. After the flower has been pollinated the leaves open out widely and the outside ones die. As the pod-like seed cases grow other leaves die, until at maturity the plant is devoid of all foliage. As soon as the seeds are mature they should be taken to a barn before the pods open and shed the seed. Threshing is a simple operation, which needs no description.

Guard Against Aphids.

Perhaps most damage is done by insect pests at this late stage. Aphids are likely to absorb the sap from the seed stalks and consequently prevent the normal development of the seed. Particular attention should be given to the destruction of this pest by spraying with nicotine sulphate. The cabbage moth is not of great importance in the late stages of growth of the cauliflower plant, owing to the fact that the leaves have wilted and died, and as the main plant has dried up it is not likely to prove attractive to the pest.

John Gardiner's Four Months.

Cabbage Seed.

The growing of cabbage seed is a comparatively simple matter in most districts. This does not mean that this crop need not be given every care and attention; it should be, particularly to prevent the crosssing of the selected plants with the discarded ones, and with other cruciferous plants.

In European countries it is usual to grow a crop of cabbages, dig them early in the winter, pit the selected plants until the winter is over and then transplant them the following spring and allow them to run to seed. Under Australian conditions, however, it is not necessary to go to all this trouble. The most important point, perhaps, is to plant the seed sufficiently late to allow the plants to flower after all danger of frost is over. On the coast, early-maturing varieties may be planted as late as April.

Some gardeners who grow their own seed select the best type of cabbage in their garden and remove the heart. The stump is then lifted and replanted in a handy position, and under certain conditions will produce flower stalks from the dormant stalk buds, and subsequently set some seed. Owing to the small amount of seed formed, however, such methods cannot be recommended for the production of seed on a commercial scale.

The large seed grower must make certain that his crop has been raised from selected stud seed. The portion of the crop that is to be allowed to run to seed must be thoroughly rogued. Pull out for market any off types that do not come up to standard. If the stumps of undesirable types are allowed to remain in the ground they are liable to form seed heads and cross with the selected plants. For the same reason it is imperative when growing cabbages for seed to have them some distance away from other cruciferous plants.

The seed head develops from the centre of the heart of the cabbage. In the case of a variety with a very compact heart great difficulty is often experienced by the seed head in breaking through the mass of leaves. If allowed to develop without assistance, it often happens that the heart twists to one side and the seed stalk is forced to come through the side. It is often advisable to make two cross cuts at right angles in the heart of the cabbage. As the seed head develops the heart leaves can be further torn apart with the fingers to allow the seed head to free itself.

Other details in connection with the saving of cabbage seed are similar to those outlined for cauliflowers.

Outbreak of Newcastle Disease in Poultry in Victoria.

Following diagnosis of Newcastle Disease in poultry in Victoria, action has been taken to prohibit the introduction of live poultry from that State into New South Wales.

Regulations have also been gazetted which restrict the introduction of carcases of poultry, also of eggs and egg containers, from that State unless they are the product of a holding not less than 15 miles distant from any holding on which an outbreak of Newcastle Disease has occurred within the immediately preceding three months, and then subject to a declaration to such effect by the owner or consignor, endorsed by an Inspector of Stock.

The introduction of finches, parrots, pheasants, or quail is similarly restricted.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Funk's Yellow Dent	... Mr. J. A. L. Thompson, Deepwater, South Gundagai.
Large Goldmine ...	... Messrs. P. Short and Sons, "Moore Park," Armidale.

Sorghum—

White African ...	... Manager, Experiment Farm, Grafton.
	Manager, Wollongbar Experiment Farm, Lismore.

Tomatoes—

Bonny Best ...	... Manager, Experiment Farm, Bathurst.
Improved Sunnybrook Earliana ...	... Mr. Albert Sorby, Macquarie Fields.
Marglobe	... Mr. S. A. Spicer, "Billabong," Lewis Ponds.
	Manager, Experiment Farm, Bathurst.

Broom Millet (selected) ... Manager, Experiment Farm, Bathurst.

Cowpea—

Black	... Manager, Experiment Farm, Grafton.
New Era	... Manager, Experiment Farm, Grafton.

Asparagus—

Connover's Colossal	... Mr. H. Eastwood, Tascott, *via* Woy Woy.
Lady Washington	... Manager, Experiment Farm, Bathurst.

Water-melon—

Angelino	... Mr. C. J. Rowcliff, Old Dubbo road, Dubbo.
Grey Monarch ...	... Mr. A. McKim, Bolwarra.
	Mr. F. J. Offner, "Mount Olive," Dubbo.

Cucumber—

Early Fortune ...	... Mr. E. Money, Terrigal.
	Mr. W. Parry, Terrigal.

Pumpkin—

Banana ("Banana Squash")	Mr. F. J. Offner, "Mount Olive." Dubbo.
Queensland Blue ...	... Mr. P. Morandini, Bunglegumbie Road, Dubbo.

Grass—

Perennial Rye Grass	... Mr. C. Watson, Pyree, *via* Nowra.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Artificial Production of Rain.

Two American scientists, Professors Warren and Bancroft, have successfully produced rain in a series of experiments based on the natural process which takes place in the upper atmosphere. Moisture is always present in the upper atmosphere in the form of minute drops, so light that they remain in suspension. When particles of dust come in contact with the drops of moisture they are absorbed, thus increasing the weight of the drops. As a result of their electric charge (positive or negative) the particles tend to become aggregated into masses too heavy to remain in suspension and then fall as rain. Thus, clouds formed of vapour too light to fall as rain may be artificially weighted by electrically charged dust and immediate rain produced.

Acting on this theory a load of electrically charged sand was dropped from captive balloons on to clouds. Rain fell immediately. Prof. Bancroft calculates that 40 lb. of electrified sand would be sufficient to dissolve into rain 1 square mile of clouds.

In subsequent experiments an aeroplane was used carrying sand with a charge, partly positive and partly negative, of 12,000 volts. The machine rose and disappeared among the clouds while spectators below awaited the miracle, which proved even more dramatic than before. The clouds burst in a violent shower of rain, while at the same time the sky cleared and the sun shone again.

In the Netherlands Prof. Veraat has succeeded in producing rain over an area of about 8 square kilometres by throwing finely divided "dry ice," *i.e.* solid carbon dioxide, from an aeroplane on to clouds. Similar experiments had been tried previously by various scientists using powdered kaolin, but had not given satisfactory results. Prof. Veraat rose to a height of 2,500 metres in an aeroplane carrying 1½ tons of "dry ice" and fitted with a special spreading apparatus; he then let the powder fall on to clouds 200 metres below. Abundant rain immediately fell. The experiment was officially controlled by observers in four military aeroplanes.

Prof. Veraat explains the formation of rain by supposing that during the fall from the aeroplane to the clouds the particles of solid carbon dioxide become electrically charged and transformed into microscopic drops of liquid carbon dioxide, which caused condensation in the clouds and consequently a fall of rain. According to Prof. Veraat this method will also make it possible to ensure fine weather when desired. By converting the clouds into rain early in the day he holds that a clear sky may be assured in a given locality for the rest of the day.

Sweet Potatoes Under Trial at Grafton.

A sweet potato variety trial was again conducted at Grafton Experiment Farm last season, but since the summer was hot and dry weather conditions prevailed up to digging time, yields were low, especially of long season varieties.

Brook's Seedling No. 3 again gave the best yield, followed by Director, while Hawaii, a new variety, also did well. Yellow Strassburg is the standard variety at this farm, since it is the best of the varieties that have been grown over the ten years the trial has been conducted.

Bovine Contagious Abortion.

The Need for Further Research.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

In the June issue of this *Gazette* we published a lecture delivered before the United Pure-bred Dairy Cattle Breeders' Association of New South Wales by Mr. W. L. Hindmarsh, Senior Veterinary Research Officer, Glenfield Veterinary Research Station, on the subject of contagious abortion, setting out the present extent of our knowledge of the disease.

In this present article Dr. H. R. Seddon indicates the lines along which further research is particularly desirable in an endeavour to arrive at a more satisfactory method of dealing with the disease.

Introduction.

THOUGH the cause of this disease was recognised some thirty-six years ago, and it has been the subject of considerable research in many countries (including Australia), there is no question but that much more knowledge regarding it is needed before it can be surely and economically combated.

There are several features of the disease which render investigation of probably greater difficulty than in the case of most other animal plagues; and the difficulty of combating it is further enhanced by the fact that the disease is not a fatal one and that the germ may live in apparently healthy stock for years, if not for the remainder of their lives.

In considering what features of the disease might form the subject of future investigation, it is convenient to discuss certain aspects, indicating the limitations of present knowledge and the manner in which further knowledge might be advantageously applied.

Diagnosis.

Owing to the fact that not all infected animals abort and that carriers may harbour the disease without showing visible signs of ill-health, use has to be made of laboratory tests. The standard test throughout the world is the tube agglutination test, and the general experience of it is such that, in all countries where action based on the elimination from the herd of all infected animals is planned, this test is used for the picking out of infected animals.

Whilst its accuracy is of a degree that by its means many herds have been so cleaned up, it unfortunately happens at times that animals give tests which offer some difficulty in interpretation. These are—(*a*) "delayed" reactors and (*b*) doubtful reactions.

Following infection, an animal usually reacts in three to four weeks, but cases have been recorded in which a positive reaction has been delayed up

to a period of even four months. In other cases an animal has been known to abort but not give a positive reaction until after such abortion. These cases appear to have invariably given a positive reaction when tested some little time (one to four weeks) after such calving and so can ultimately be recognised. Fortunately such cases are rare, but there is grave danger from them inasmuch as the animal may spread infection before it has been recognised as a reactor.

The remedy for this is not easy to see. Possibly a more sensitive test might be found, but these cases seem to be more related to individual idiosyncrasy than the technique of the test itself. This phase is being explored in other countries and the best line for us seems to be to watch for and observe these cases. It must not be supposed that whenever a non-reacting animal aborts it is necessarily one of these "delayed" reactors. Our observations—and those made elsewhere—show that abortions may occur in animals not affected with Bang's bacillus. To determine what are "delayed" reactors and what are "cases of abortion due to other causes," and the frequency with which cases of each type may be expected, is important. We are watching for delayed reactors in herds which are being cleaned up by the agglutination test, but the causation of abortion by organisms other than *Bacillus abortus* should be a matter for research and will be discussed later.

With all tests it is usual to get a certain percentage of doubtful reactions. Many of these are in animals which have recently been infected and are really in the nature of a partial reaction—a half-way stage, as it were—for the animal on next testing gives a positive reaction. Some animals, however, give a doubtful or suspicious reaction on about one-third of the occasions they are tested, the other tests being negative. By following the breeding records of these and by certain modifications of the test we have been able to reduce the number of doubtful reactions. After further observation we may be able to reduce these to a still lower percentage of all tests, but we must always expect a certain percentage of such tests, these being furnished by those animals which have been recently infected. Possibly by the employment of another type of blood test (complement fixation) we might recognise the doubtful reaction which is really an incipient positive (or a negative), but such test is much more elaborate than the agglutination test and world opinion does not seem to justify its use. It is not regularly employed anywhere, either alone or as an adjunct to the agglutination test.

A third type of test—by a special injection into the animal to be tested—has been suggested and tested experimentally. It has not been established anywhere as a diagnostic test, and, whilst opinions of it vary they are generally against it. A serious disability of this test is the time an animal has to be under observation, viz., three days. It therefore calls for much greater time from the veterinary officer than the agglutination test and possesses a further disadvantage inasmuch as there is difficulty in registering the degree of reaction.

GOVERNMENT GRAIN ELEVATORS.

(Operating under the "Wheat Act, 1927.")

Season 1932–33.

To

Wheat Growers!

WHEAT will be received on account of growers, millers, shippers, and others, at the following stations:—

Alectown West
Alleena
Arthurville
Ardlethan
Ariah Park
Balldale
Barellan
Barmedman
Beckom
Belfrayden
Berrigan
Billimari
Binya
Bogan Gate
Boorowa
Coree Creek
Bribbaree
Brocklesby
* Brundah
Brushwood
Buddigower
Burrumbuttock
Calleen
Canowindra
Caragabal
Combaning
Coolamon
Culcairn
Cumnock
Cullivel
Cunningar
Curban
Dubbo
Erigolia
Eugowra
Eumungerie
Ferndale
Finley
Forbes
Ganmain
Garema
Geurie
Gidginbung
Gilgandra
Girral
Gooloogong North
Goonumbla
Greenethorpe
Grenfell
Grong Grong
Gunningbland
Harefield
Henty
Holbrook
Hopefield
Illabo
Kamarah
Ladysmith
Lockhart
Maimuru
Mangoplah
Manildra
Marinna
Marrar
Matong
Milbrulong
Milvale
Mirrool
Molong
Moombooldool
Munyabla
Narromine
Nelungaloo
Oaklands
Old Junee
* Ootha
Parkes
Peak Hill
Pleasant Hills.
Pucawan
Quandary
Quandialla
Rand
Reefton
Shepherds
Stockinbingal
Tallimba
Temora
The Rock
Tichborne
Tomingley West
Tootool
Trundle
Tullibigeal
Urana
Urangeline
Uranquinty
Ungarie
Walla Walla
Wallendbeen
Wattamondara
Weethalle
Wellington
Wirrinya
Woodstock
Wyalong
Wyanga
* Yarrabandai
Yeoval
Yerong Creek
Yiddah

* In course of construction; completion expected about end of November.

NEW plants will be in operation at Ferndale, Pleasant Hills, and Shepherds.

GROWERS should patronise the system which has been provided in their interests to enable them to effect considerable savings in the cost of handling their wheat, to ensure safe storage, and to eliminate the necessity for purchasing cornsacks.

WHEAT may be delivered from clean second-hand cornsacks.

Inquiries are Invited.

2nd Floor, Department of Agriculture,
Raphael Street, Sydney.
Postal Address:
Box 36A, G.P.O., Sydney.

E. HARRIS,
Wheat Commissioner and
Manager, Govt. Grain Elevators.

Summed up, therefore, our aims are—

(*a*) To get more experience with a view to better interpretation of the agglutination test as a means of diagnosis.

(*b*) To follow out the subsequent history (as far as possible) of doubtful reactors.

(*c*) To collect information to determine the frequency with which delayed reactors may be expected.

All these aims are at present under investigation.

Source and Spread of Infection.

One may now review the various locations where abortion bacilli may be found and the mode by which infection may be spread from these, discussing the danger of such infection to other animals, since our information in certain directions is not complete.

1. Cows.

Apart from during calfhood, abortion bacilli have not been found in female cattle until these animals have been bred. They have been found in the uterus and udder of heifers in calf, and, of course, in grown cows. The most dangerous material is the foetus, foetal membranes and exudate from the womb from any reacting animal, whether it has carried the calf to full term or not. Any discharge from the womb at this time is dangerous, but, practically speaking, we can say that about two months after abortion the womb will be free of abortion bacilli. The actual duration is really immaterial, for we must recognise two things, viz.:—

(*a*) That any animal which has aborted or has been proved to be a reactor is a potential source of danger, and clean stock should not have contact with it nor with ground over which it has run.

(*b*) That no animal which has a vaginal discharge should be served by a bull used for clean cows, as it may mechanically transmit infection, causing either contagious abortion or sterility, or both. It is because sterility is often spread in this way that owners should be warned against the service of such a cow.

A more important point in connection with the spread of infectious material from the womb (foetus, membranes and exudate) is the question of how long ground so contaminated will retain its infection. One cannot state definitely the period for which a pasture will remain infective. It is probable that under European and American conditions pasture retains its infection for a longer period than in Australia, where pasture is, generally speaking, shorter (thus affording less protection), and there is more exposure to sun and drying (both of which are the active agents which bring about destruction of the bacilli). Certainly, in winter in the dairying districts of this State we may get a set of conditions somewhat approximating those obtaining in the milder period of the year in Europe and America, and which undoubtedly would favour persistence of the organism in the pasture, but in the summer here the reverse is the case. Though

observations are necessarily limited, it is worthy of mention that the longest period for which infectious material on the ground has been found to retain that infection is 140 days, and this occurred under circumstances where the material was well sheltered from the sun. Observations on the viability of the bacilli in infectious material exposed under Australian conditions is urgently required, in order that we may have definite information regarding it.

Abortion bacilli are commonly spread by infected cows also with their milk, practically all reactors so eliminating the bacilli from time to time, some quite commonly. Though this fact has been known for many years, it is not thought to be as dangerous as infection from the womb. Nevertheless, it is recognised that litter and fodder may be so contaminated and be a source of danger, especially where animals are housed, as they are in the winter in both America and Europe.

It has also been found that enlargements (hygroma) about the knee or hock in cattle may be due to abortion bacilli, but from the point of view of spread of the disease these are unimportant for the reason that the lesions are closed, *i.e.*, they do not suppurate or "break out," and the bacilli do not get spread from them unless they are intentionally opened.

It is important to recognise with all these materials that clean stock may be infected in one of three ways, viz., (*a*) by ingestion, (*b*) through the skin or mucous membranes, or (*c*) by mechanical transmission during service.

The licking of voided exudate, and eating of foeti and membranes or of pasture or cut fodder contaminated by such material, are recognised as probably the commonest modes of infection. It has been shown experimentally in Australia, and confirmed in America, that if infectious material gets into the eye (really into the conjunctival sac) infection may result, as the bacilli are able to enter through the mucous membrane. Recently it has been shown in America that infection placed on the skin may likewise enter, but in this case more easily if the skin is slightly abraded. This is certainly a possible method of spread in Australia where cows with a vaginal discharge not infrequently transfer it to their neighbours in the bails by a swish of the tail. Our tests on guinea-pigs have shown that the bacilli may easily penetrate its skin, but further tests on cattle, using natural infectious material, are indicated.

A possible, and almost certainly a not unusual mode of spread, is mechanical transference by the bull. Quite frequently reacting cows are served at the first heat period after abortion or calving, and, though in many of them the infection in the vagina will have cleaned up, a large percentage will still carry this infection. Such infection may be carried mechanically by the bull, and, though many American and European workers at one time doubted its possibility, it is now recognised that the bacilli may pass through the vaginal mucous membrane.

Some definite experimental work to expose this danger might be attempted.

2. Bulls

Quite apart from cases where it acts as a mechanical carrier, the bull plays an important part in this disease, for it is now generally recognised that the bull may actually be infected with abortion bacilli and that these bacilli may cause disease in him. In this case the bacilli get into the testicles or other parts of the male genital organs and set up an inflammatory process. A common symptom is enlargement of the testicle, but not infrequently the disease is in other organs within the pelvis, and externally there are no visible signs of the disease. It has been shown, however, that in these cases the bacilli may get into the seminal fluid, and so be spread to the cow. Fortunately, such bulls commonly become sterile and useless for breeding, and their use is therefore limited. The dangerous animal, however, is the bull which has not yet become impotent, and in all attempts made to clean up infection in a herd the bulls should be systemically examined and tested.

The extent to which infection occurs in bulls in Australia has not yet been determined, but by agglutination tests carried out at Glenfield Veterinary Research Station a number of such cases have been found, some quite unexpectedly owing to the absence of symptoms. During a period of two months just recently we have had four cases, and more attention might be paid to this phase of abortion disease. In America about 1 per cent. of bulls running with infected cows have been found to be infected.

3. Calves.

It is recognised that full-term calves from reacting animals may have abortion bacilli in their bowels and that from the feeding of mixed skim-milk many calves from clean cows commonly take in abortion bacilli with their food. In all these cases the bacilli may pass through the animal and be spread in the dung. For what period such animals spread this infection is somewhat a matter of doubt, but one investigator has stated that such animals will harbour the bacilli in their bowels for a long time. He adds, however, that it appears as if it is difficult for the bacilli to multiply in the bowel and that the bacilli are therefore quickly conquered by other organisms in the bowel. There is no direct information as to the danger to grown stock of ground so contaminated and the general opinion seems to be that it is slight. This is based, however, on indirect evidence which assumes that in the vast majority of cases infection of adult stock is from foeti, membranes or exudate.

Further information in this direction might be sought and would be of value in connection with advice concerning grazing arrangements for calves and adult stock to owners who are building up an abortion-free herd.

4. Horses.

Abortion bacilli have been found to be the cause of fistulous withers, but until such lesions suppurate or are intentionally opened infection is not spread. Horses so affected would be a source of danger on a clean farm.

5. FOWLS.

Fowls, likewise, have been found to contract abortion infection, but it has so far not been shown how the organism may escape from them, nor what is the actual danger to cows running over ground where affected fowls roam. The probability is that in the natural spread of the disease amongst cattle, fowls play a small part indeed.

Active and Latent Infections.

1. COWS.

The general experience is that 90 per cent. of animals carry the germ for years, *i.e.*, only about 10 per cent. become completely free from it. Further investigation is required, however, to determine just what percentage of animals may be expected to recover. Those animals which do recover are apparently able to do so only because for some reason their udders are unsuitable as a habitat for the organism. No systematic inquiry seems to have been undertaken on this point, and such is strongly indicated, as it might throw light on the matter of immunisation.

2. CALVES.

It has been pointed out that though calves of reacting cows may be born with abortion bacilli in their bowels, there is reason to believe that such bowel-infection does not remain there indefinitely. Calves fed on milk of reacting cows may similarly take in the germs, with the same result.

The important question, however, is whether the abortion bacilli are able to gain entrance to, and persist in, any of the internal organs of calves, and in this connection it may be stated that there is every reason to believe that they cannot do so.

Agglutination tests taken of calves a few days old show that the majority of those from reacting cows themselves react. They remain reactors, however, for only a limited time, giving negative reactions after they are three to four months old. This disappearance of a positive reaction is strong proof of absence of persistence of infection, and is rather what one would expect, seeing that in such young animals the organs commonly affected in later life are still rudimentary and undeveloped. When, however, puberty is reached the sexual organs and udder (now developing) can take up the infection.

Rather curiously, it appears as if the only milk capable of stimulating a positive reaction is the colostrum, for even calves still suckling reacting cows will cease to react. This opinion is concurred in by both American and European authorities, and our Australian observations are in accord.

That no latent infection does persist from calfhood to adult life is confirmed by the fact that calves from reacting cows are not more likely to abort than calves from non-reactors.

It can be expected, therefore, that:—

(*a*) Calves are resistant to infection with abortion bacilli until they reach the breeding age.

(*b*) That though they may react when very young, after the age of four to six months they become non-reactors.

(*c*) Calves born of infected mothers, therefore, may be taken into a non-infected herd without risk of carrying in the infection *unless such is still present in their bowels or carried in mechanically, as for example on their feet.*

The possibility of latent infection in calves has been so fully investigated elsewhere that there does not seem need for further work here. What is required rather is more knowledge on which to base some practical scheme whereby use may be made of calves for adding to a clean herd or for building up a new herd without the possible danger that exists from them carrying in infection mechanically on their feet or in their bowels.

The Relation of Contagious Abortion to Sterility.

It has been a matter of common observation that where the rate of abortion in a herd is high, the cattle later do not breed readily, and the association of abortion and sterility has assumed such proportions in the eyes of some investigators that they have referred to contagious abortion and sterility as if these were a single entity. Instances of the improvement in the ratio between services by the bull and conceptions by cows after the removal of reacting cattle are to be found in some of the herds in New South Wales which have adopted the departmental scheme for the eradication of contagious abortion. Further evidence in this direction is to be found in the work being carried out in the investigations into sterility. Herds in which no reactors to the agglutination test have been found respond much more readily to treatment for temporary sterility than herds in which contagious abortion is known to be prevalent.

In order that we may understand better the problem of sterility and the exact relationship of contagious abortion to it, much advantage would come from the linking up of an investigation into abortion with our present investigation on sterility. Conversely, in herds which are the subject of treatment for sterility the extent of contagious abortion might be more fully studied.

Other Causes of Abortion than Bacillus Abortus.

It is recognised that abortion might be brought about by (*a*) accident, (*b*) structural abnormality of the womb; (*c*) *Bacillus abortus*, or (*d*) other infections.

Accidental Abortions.—These are by no means as common as is generally thought. They do occur, but because abortion follows an accident it does not necessarily mean that the animal was not affected with contagious abortion. Indeed, such cases have come under personal notice.

Structural Abnormality of the Womb.—In a smaller number of cows this likewise occurs, and such animals commonly abort at each pregnancy.

Bacillus abortus is the common cause of infectious abortion in all countries.

Other Infectious Types.—One type due to a "vibrio" has been met with in Europe and America, but not seen so far in Australia. Nevertheless, we have reason to believe that infections other than *B. abortus* do exist. For example, in one herd there were eight abortions in as many months, and as none of these animals reacted to the agglutination test, we consider they must have been due to some other type of infection. Similar evidence has been gathered from other herds.

In other countries, in herds which have been freed from contagious abortion by means of the agglutination test, some abortions have been found to occur. The sum total of these is small, but in odd individual herds they may be frequent, and from their frequency it is agreed that they are probably of an infectious type.

This point is of considerable practical importance, since one must not expect that with freedom from *B. abortus* all abortions will cease. Nevertheless, the herd will have been freed from that type of abortion which is commonest in occurrence.

It has also been noted that there is a certain parallel between these "other infections" and the existence of sterility. Sterility is frequently due to an inflammatory condition of the vagina and womb, and it can be readily understood that an animal with an inflamed womb may abort. There is also evidence that much of the sterility seen in Australia is of an infectious nature, and there is reason to believe that not infrequently it is transmitted by the bull.

What is urgently wanted, therefore, in order to reduce these "other infectious" abortions, as well as contagious abortion, is further investigation both into those types which are definitely associated with sterility and also into those where up to the present no cause has been found.

Treatment.

The treatment of contagious abortion by the use of drugs, given either by the mouth or subcutaneously, at present holds out no promise, although almost every drug which it was thought might possibly be of use has been tested. Such tests are being continued in many countries.

Conclusion.

In summary, therefore, more exact knowledge is required concerning:—

(*a*) Diagnostic tests—to improve their reliability.

(*b*) Period for which contaminated ground may remain infective—to assist in grazing arrangements for herds which are being cleaned up by means of the agglutination test.

(*c*) Recognition of actual danger of infected bulls—to ensure their detection and elimination from herds.

(*d*) Possibility of spread of bacilli by calves—to formulate practical measures whereby they may be used for building up abortion-free herds.

(*e*) Cows which actually spontaneously recover from infection—as knowledge regarding this might help in devising a system of immunisation.

(*f*) Relation of abortion to sterility—to assist in overcoming the losses from sterility.

(*g*) The various causes of abortion—so that not only the common type of contagious abortion but other forms of abortion may be banished as far as possible from our herds.

Hawkesbury Agricultural College Examination Requirements.

An alteration has been decided upon in connection with the examination requirements for candidates for admission to Hawkesbury Agricultural College, Richmond. Hitherto it has been the practice to require applicants who do not possess the Intermediate Certificate issued by the Department of Education, or its equivalent, to sit for an entrance examination, which has in the past been held at the College immediately prior to the commencement of the first session. It has, however, now been decided to eliminate the entrance examination as such, and to require that applicants must possess the Intermediate Certificate (including English and Mathematics I) or its equivalent.

It has also been decided that the award of scholarships tenable at that institution will be made on the results of the Intermediate Certificate examination, subject to consideration of the candidate's aptitude, fitness, physical strength, and other qualifications necessary to become successful in agricultural work. The award will be made on the aggregate marks obtained in six subjects at the examination in question, such subjects to include English, Mathematics I, and four subjects selected from the undermentioned groups:—

Not more than two of the following:—History, Geography or Commercial Geography, Mathematics II, Business Principles.

Not more than two of the following:—Physics, Chemistry, Elementary Science, Botany, Geology, Agriculture I, Agriculture II, Agricultural Botany, Physiology and Hygiene.

Not more than one of the following:—Latin, Greek, French, German.

Not more than one of the following:—Technical Drawing, Woodwork, Metalwork.

The control of cattle tick is a vexed and difficult problem, but in the Department's pamphlet, "The Cattle Tick Question," farmers will find a clear and concise statement of the essential facts. It is obtainable free on application to the Department of Agriculture, Box 36A, G.P.O., Sydney.

Protein.

Its Chief Functions in Animal Nutrition.

C. J. SANDERSON, M.R.C.V.S., Senior Veterinary Surgeon.

The following is the report of an address given recently by Mr. Sanderson to a gathering of farmers. It stresses the importance of, and explains in popular terms, the role that protein plays in animal nutrition. Dairy farmers in particular have much to gain by acquiring a better understanding of this problem. Particular reference is also made to the value of protein in sheep feeding.

NITROGEN is one of the elements without which no form of life can exist. It forms, with other elements, a great number of compounds, some simple, others like proteins, which are probably the most complex group of chemical compounds known. The function of proteins in nutrition is of the greatest importance, because they comprise the greater portion of the animal body. Muscles (lean meat), tendons, nerves, internal organs, in fact the whole of the working machinery of animals is composed of protein.

Three Main Functions.

Protein in animal nutrition may be said to have at least three functions—

(1) The building and repair of tissues.

(2) The provision of material for the preparation of secretions, *e.g.*, hormones, internal secretions, glandular products and digestive juices.

(3) Tissue stimulation.

The amount of protein required is governed by the following factors:—(1) Growth and health; (2) secretions, *e.g.*, milk, and (3) work.

It can be stated that no stockowner can feed his animals successfully unless he understands the use of protein. For one thing he is liable to spend money to little advantage in buying certain feeds in drought time if he does not understand the problem.

As an example let us take the growth of the young. This demands a large amount of protein because it is required for the rapid development of the young animal. An analysis of the milk of the various animals shows that the most rapidly growing varieties contain the greatest proportion of protein in the milk.

ANALYSES of Milk of Different Animals.

	Cow's Milk.	Sow's Milk.	Mare's Milk.	Ewe's Milk.
	per cent.	per cent.	per cent.	per cent.
Fat	3·69	6·64	1·14	8·94
Casein and albumen	3·55	6·30	2·05	6·30
Milk sugar	4·88	5·56	5·87	5·06
Ash	0·71	1·01	0·36	1·02

In order to understand the necessity for such a liberal supply of protein. it is necessary to remember that protein acts as a cell stimulant, which not only encourages growth of muscles, nerves, etc., but also ensures the digestibility of food eaten. If then protein is so necessary in the milk to ensure rapid growth of the young, it is obviously necessary to arrange that lactating animals should have plenty of milk. This is frequently not the case, and one often hears that the ewes or sows had little milk and the young lambs or pigs did not do well. To ensure that the foetus in utero develops well and is born strong and healthy, grows rapidly and keeps healthy after birth, it is necessary that the percentage of protein present in the feed of the dam both before and after birth of the young is high. If the amount of protein required before the birth of the foetus is not available in the feed it will be taken from the dam's tissues to her detriment. This is nature's way, always thinking of the future of the race at the expense of the present.

Why Nature Provides Colostrum for New-born Calves.

Another reason for supplying protein during the last few weeks of pregnancy is to ensure the foetus when born a liberal supply of milk to give the new born a good start in life. Let us see what nature does in starting the young in life. It would appear that nature recognises the necessity for providing a large quantity of protein to start, as it were, the machinery of growth and life. It can be compared to charging an electric battery. The young animal is born, and nature in the first milk supplied by the dam arranges to at once provide the means to stimulate every cell to activity, including every gland which governs metabolism and digestion. The first milk is known as colostrum, and this differs in many respects from the milk which is subsequently secreted. This will be clear from the following analyses of cow's milk by Konig:—

ANALYSES of Colostrum and Normal Milk.

Per 1,000 Parts.	Water.	Solids.	Casein.	Other Protein.	Fats.	Sugar.	Salts.
Colostrum ...	746·7	253·3	40·4	136·0	35·9	26·7	15·6
Milk	871·7	128·3	30·2	5·3	36·9	48·8	7·1

You will note that colostrum contains many times the amount of protein that ordinary milk does. Nature here clearly points the way to encourage growth, and following in her footsteps we find from practical experience that the most economical results in feeding growing animals are obtained with feeds containing large percentages of proteins.

The Cell-stimulating Action of Protein.

In order to understand the necessity for such liberal supplies of protein it is necessary to remember that protein acts as a cell stimulant. When an animal at rest has starved for several hours the rate of energy metabolism reaches a definite level and remains fairly constant so long as the animal remains at rest. If the animal is then fed liberally with either fat

or carbohydrate the rate of energy metabolism rises slightly as a direct result of the utilisation of these foods. If, however, the animal is fed a liberal amount of protein-rich food there is a surprising acceleration of the metabolic processes and a marked increase of the energy set free in the tissues. Bidder and Schmidt experimented on a cat. During a certain time the animal used 50 grammes of oxygen and eliminated from its lungs 53 grammes of carbon dioxide. It was then allowed to eat all the meat it would consume and the observations continued. During a similar period it then used 103 grammes of oxygen and eliminated 113 grammes of carbon dioxide.

This cell-stimulating action of protein has a great influence on various aspects of animal nutrition. For example, a certain percentage of protein is necessary to ensure the digestibility of food. In a trial with sheep it was found that the addition of ½ lb. of starch to a ration containing 1¾ lb. of hay reduced the digestibility of crude protein from 54 to 32 per cent. and of fibre from 60 to 54 per cent.

This depression, Henry* states, does not occur when a proteid food such as oil meal supplements the starch and sugar. This knowledge can be put to use in drought feeding. When only coarse, innutritious, indigestible roughage exists for feeding, the value of this rough stuff even cannot be obtained because it is so indigestible, but add a small amount of protein which stimulates the intestinal glands, and it is digested and its feed value greatly increased. Again, in animals giving milk, protein is necessary to supply protein in the milk, but protein acts as a stimulant to the udder, causing it to secrete increased quantities of milk.

This function of protein is responsible for the success of Boutflour's "steaming up" process, in which cows are fed a gradually increasing amount of concentrates during the six weeks before calving. The effect of this is not only to increase the yield of milk immediately after calving, but also to ensure that the cow will yield milk in payable quantity for a longer period than she would if not so "steamed up." The necessity for this protein feeding before birth of the calf cannot be too strongly insisted on, because it is the exception to find stockowners carrying this out. Rather do they wait to feed the cow after she has actually calved, which is too late.

Protein Prevents Sterility.

Another way in which protein plays an important part is in the prevention of sterility. There is ample evidence that nutritional deficiencies effect sexual activity and have a great influence on fertility. As pointed out by me in previous addresses, deficiencies of lime and phosphoric acid in cattle have been attended by sterility, which has been averted when the cows have been fed regular rations of bone meal. It is a well recognised fact that certain of the ductless glands (for example, the pituitary gland) have great influence on the animal's sexual activities, and the gland stimulation, which is one of the functions of protein, must have a great influence

* Henry and Morrison: "Feeds and Feeding."

in combating sterility. You have found this out for yourselves and put it into practice by flushing the ewes with protein feed before putting them to the ram. This flushing with feed in an easily assimilable state and containing protein has the effect of stimulating the glands concerned in reproduction.

Frequently veterinarians are asked by stockowners to suggest means to rouse the sexual desire of animals. Such substances are known as aphrodisiacs, and no more certain means of destroying the fertility of a sire can be devised than by continually using these stimulants. As a matter of fact there is no necessity for such adventitious aids. If your animals are well fed they will be in good health and their functional activity will be at its highest. Feed well and breed well.

Influences Rate of Reproduction and Amount of Production.

With domestic animals we can arrange that they are supplied with food sufficient for their needs, and sufficient also for the development of their young in utero, and for the suckling of the young when born. Animals in the wild state, dependent on what feed they can pick up and having no one to arrange for pastures containing higher protein amount than is found in the natural pasture, do not breed early or regularly, because they have the instinct to recognise that they have not sufficient material in their bodies to carry the job to a successful conclusion. The rate of reproduction thus depends on the amount and quality of the food supply. Can we not assume that the same thing takes place with domestic animals, more especially if you will remember the very much greater demands made on feed by the domestic animal?

Just as an illustration of this, let me quote what a modern type of cow can do in production and what a demand she makes for protein and minerals. While the ox puts feed into fat, the dairy cow turns feed into milk. The cow produces human food with far greater economy than any other animal. An ox fattening, putting on 15 lb. of flesh weekly, produces 1.13 lb. protein as lean meat. In the same time the cow yielding 30 lb. of milk daily produces nearly six times as much protein. While the ox puts on 9.35 lb. of fat, the cow puts 7.35 lb. of fat into her milk. The ox stores 0.22 lb. of mineral matter, while the cow puts into her milk 1.57 lb. of minerals, or over six times as much during this time. Henry and Morrison in their standard work, "Feeds and Feeding," state that in one year a cow produced 2,218 lb. of dry matter which was wholly digestible and suitable for human food. As the steer's body only contains 548 lb. of dry matter it follows that the cow produced enough protein to build the bodies of three steers, fat sufficient for nearly two and mineral matter enough for three, besides 920 lb. of milk sugar.

When we consider these figures and realise that protein is never very abundant in vegetable foods, the necessity for the intensive campaign of pasture improvement for producing from a given area a greater amount of both protein and minerals can be understood. As a matter of fact, pasture improvement alone cannot be depended on to satisfy the needs of our

highest producing animals. Wagga Gladys, wonderful dairy cow that she is, could not obtain sufficient protein from the natural pastures for her production of milk, so concentrates containing large quantities of protein have to be fed to her.

Effect of Protein on Wool Growth.

The same can be said in connection with wool production. As I pointed out on a previous occasion, one of the nineteen substances of which protein is composed is the sulphur-containing amino acid cystine, which forms 13 per cent. of the wool fibre. Sheep must obtain this from the proteins of the fodder and the vegetable proteins in natural pastures contain very little cystine indeed. Here again the solution of the difficulty does not appear to be with pasture improvement, but rather in the supplementary feeding of a proteid concentrate containing cystine. Pasture improvement will certainly increase the total amount of cystine in the pastures, but it will not increase the proportion of cystine to the other constituents.

Two examples of the good effect on wool production of feeding protein-rich supplements are published by the Council for Scientific and Industrial Research in Bulletin No. 61.

1. An experiment was planned at Meteor Downs to determine the response in the wool growth by Merino sheep when the natural pasture, which, during many months in the year is deficient in protein, was supplemented by a protein-rich concentrate. In discussing this experiment Mr. Marston, who conducted it, concluded that when the level of protein intake falls below a certain value, the wool production suffers first. The concentrate chosen was blood meal—a slaughterhouse by-product containing 80 per cent protein and approximately 2.7 per cent cystine.

During the first year the flock receiving blood meal *ad lib.* cut 30 ounces more than the control flock which received no blood meal. The quality of wool from the blood-meal fed flock was a well-grown 64's count, while the fleeces of the control group were predominantly 64's, but there were many poorly grown and tender 70's.

During the second year of the experiment, the difference in wool clip was greater than at the first shearing, the difference being 35 ounces in favour of the blood-meal fed flock. To get better results with supplementary protein feeding in the second year is a common occurrence and indicates that the effect of such feeding is cumulative. The fact that the lambs of the blood-meal group grew better before they themselves partook of the blood meal suggests that they benefited from the increased milk production of their mother ewes as a result of the extra protein feed.

2. A report from Molo in South Africa, outlining the effects of the supplementary feeding of sheep on protein-deficient pastures, shows that by giving 2 ounces per head per day of a protein-rich supplement consisting of fish meal 40 per cent., meat meal 10 per cent., and Sim Sim cake 50 per cent., an increase of about 30 per cent. in the weight of wool fleece grown and a general improvement in quality results.

Green Feed Deficiency Disease in Fowls.

J. K. HUTCHISON, B.V.Sc., Veterinary Research Officer.*

Introduction.

THE provision of green feed in the daily ration of fowls has long been recognised to have a beneficial effect both on health and egg-production. However, only in comparatively recent years has it been realised that in green feed is a substance which is essential to life, and that unless this substance is provided in other nutrients, such as cod liver oil, a disease of the eyes, throat, gullet and windpipe may result, and this be accompanied by severe mortality. If green feed is not supplied it is to be expected that the birds may show poor development, unthriftiness, lessened egg-production, leg-weakness, bad feathering and poor fertility and hatchability of their eggs. That a definite disease results from the uncorrected absence of green feed in the diet makes the provision of adequate, fresh, succulent green feed a necessity.

The disease that results is known as "green feed deficiency disease," "avitaminosis A," or "nutritional roup" although the last-mentioned term is unsatisfactory inasmuch as the complaint is non-infectious and the word "roup" is already used to designate a number of distinct diseases apparently infectious in nature.

Green feed deficiency disease has certain characters which might suggest an infectious disease, but it is definitely non-communicable. At first an odd bird is noticed to lose condition and later show inflammation of the eyes. This is followed by the appearance of similar symptoms in several other birds, the affection consequently appearing to be of an infectious nature. Owners are therefore tempted to treat affected birds and may waste considerable time, for no local treatment of the eyes is of any value. The losses, therefore, continue until they are serious indeed.

The Cause.

The cause of the disease is a deficiency in the ration of vitamin A, one of the essential food factors, and of which the chemical nature is not yet fully understood. This vitamin is present in other foods besides greenstuffs, notably in carrots and cod liver oil. It is also found to a lesser extent in milk and eggs.

Vitamins are complex substances essential to life or life functions, of which the most important things known are the serious effects which result from their absence in the ration. Vitamin A serves to promote growth and prevent this deficiency disease.

In fowls, more so than in any other animal reared for commercial purposes, the diet is controlled practically solely by man. It is, therefore, only to be expected that fowls are more likely to become the victims of man-wrought vitamin deficiencies. While most poultry farmers grow crops to

* Since contributing this article Mr. Hutchison has resigned from the Department.

provide a suitable supply of green feed all the year round, it frequently happens that at times, through drought or lack of water supply, or through the ravages of plant pests and diseases, no green feed is available. The common belief of poultry farmers is that green feed is an additional foodstuff producing better results, and that its temporary absence can be suffered without detriment to health; it is not realised that it contains a substance, rarely supplied by any other foodstuff. Many poultry farmers include cod liver oil in the diet, but without realising that it can act as a substitute for greenstuff. When neither cod liver oil nor greenstuff is available for a period of a few weeks the complaint under consideration is liable to result.

The condition occurs most frequently during both early and late summer months, through failure of crops owing to lack of water. It is, of course, likely to occur at any time of the year when crops have been destroyed by plant disease or pests.

Age of Birds Affected.

Green feed deficiency disease is seen most frequently in young stock, but is quite likely to occur in older fowls if the deficiency continues for a sufficiently long period. It is rarely seen in young chickens for the reason that such green feed as is available is usually allotted first for the use of the chickens. Pullets and cockerels show the deficiency more quickly than first or second year hens. Adult male birds, although susceptible, are not frequently affected, as they are able to withstand the lack of the vitamin much more than the smaller laying hens, which pass some of their own vitamin A into their eggs.

Duration Before the Onset of the Disease.

The length of time between the beginning of the deficiency and the onset of the disease is very variable. A good deal depends upon the health and condition of the birds when they first receive the deficient diet, and of equal importance is the ration of the fowls for some months prior to this time. The vitamin is, as it were, stored within the body and the fowl is able to withstand its absence for some little time. The disease may be expected in from three or four weeks in pullets (even less in young pullets), but may be delayed for four months in grown cocks. Under normal conditions in summer months the onset of the disease occurs after the diet has been deficient for about six weeks. It is not to be thought that no ill-effects need be feared following the lack of green feed for anything less than this period, for in this time a flock will gradually go off in condition and the egg-production decrease.

Symptoms.

The first sympton in green feed deficiency disease is a general falling off in condition; the feathers lose their lustre, and growth and development are at a standstill or retarded, though the appetite is still unaffected. Birds

And now - the PERDRIAU TYRE

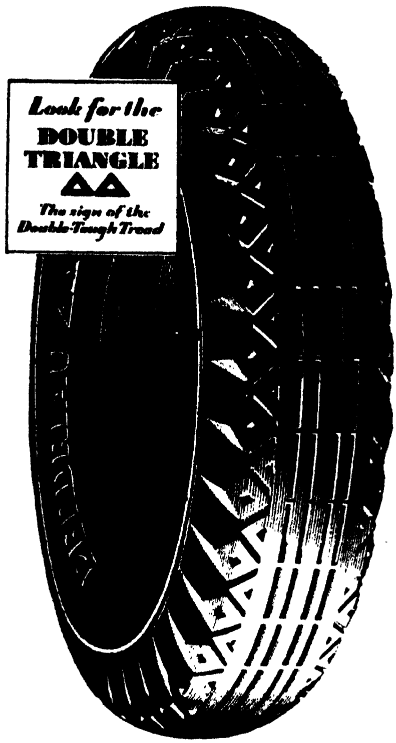
with a DOUBLE-TOUGH TREAD

. . . . *better than ever!*

The Perdriau Tyre — with its tough, triangle tread—has always been a high-grade tyre. This is proved beyond doubt by thousands of letters received from satisfied users. But, good as the Perdriau has been in the past, it is now even better because of a new, double triangle tread of double compressed rubber. In short, it is the same tyre that has made the name Perdriau famous—plus a new tread into which greater mileage has been built.

HIGHLIGHTS from letters giving users' opinions of Perdriaus.

- . . . Perdriau Tyres. Many we find have done over 20,000 miles and some over 25,000 — H. & D. McRAE, SYDNEY
- . . . using Perdriaus on racing cars since 1925 . . . Never had a puncture or blowout during practice or competition work. — J. R. JENNINGS, MELBOURNE
- . . . Have obtained up to 30,000 miles from original tyres and these are even now in good order. — J. C. HUTTON, LTD., BRISBANE
- . . . Appreciate such economical costs per tyre mile . . . average per cover 15,856 miles. — YELLOW CABS, ADELAIDE



For clean sharpness of moulding and sleek perfection in finish the improved Perdriau Double Triangle Tyre has no equal

Perdriau

DOUBLE TRIANGLE

in lay gradually go off in egg-production. As the condition progresses some birds are noticed to be wasting. Later, of course, more and more birds are similarly affected until the diet is corrected.

If the throat is examined at this stage small white pimples or pustules may be seen either in the mouth, on the back of the base of the tongue, in

Mouth and Throat of Fowl Opened up to Show Pustules in Wall of Gullet.

the throat, or in the gullet. Later these pustules extend down the gullet and some are even found in the crop. If examination of the throat is undertaken at this time and the presence of these pustules observed, considerable losses can be avoided, as the disease may be stopped immediately by the

addition of green feed, carrots or cod liver oil to the ration. However, the disease is usually allowed to proceed further.

Some affected birds show a slight discharge from one or both nostrils, but this is variable. In the later stages, however, the nasal cavities are frequently plugged up with cheesy material which closes up the cleft in the palate, and usually causes a lowering of the palate itself into the mouth cavity.

Towards the late stages of the disease there is profuse watering from the eyes, usually from both, with reddening and swelling of the eye structures. Not infrequently the tear duct running from the eyes to the nostrils is distended with a discharge which cannot escape and the tissues below the eyes become puffed out. A white material, which may be readily squeezed out by slight pressure, accumulates within the eyelids and when this is present there is an absence of watery discharge. This feature is very characteristic of green feed deficiency disease, and, although not exclusively so, should warrant immediate inspection of the mouth and throat for pustules, and these, if found, indicate the need for a corrective diet. Naturally, the affected eyes do not respond to local treatment, and a few hours after the removal of the white material from the eyelids more may be found.

Sick Bird Showing Swollen Eyes, with Accumulation of Greyish-white Material Between the Lids.

The presence of a clear white removable solid material in a comparatively dry eye distinguishes this eye trouble from the other eye diseases (the so-called "eye-roups"), when the matter present is usually yellow and not white, and cannot be readily removed, and when frequently there is an accompanying profuse watering.

At the same time as the eyes become involved, or even a little earlier, some birds show indications that the breathing tubes are involved. The breathing is rendered difficult and frequent attempts are made by an affected bird to "clear its throat." Inspection shows that the glottis (which is the entrance to the windpipe) is more or less closed up with mucous, or, more often, cheesy material. This again is distinguished from that seen in other diseases of the throat in that the material is easily removed. Sometimes a complete tubular mass accumulates along the lining of the windpipe. Material in the windpipe often causes the death of the bird by asphyxiation.

Death usually occurs in from one to five days after the eyes become affected, the bird by this time having become severely wasted, but the total period of sickness may vary from a few to fourteen days or even longer.

Post-mortem Appearances.

The appearance of affected eyes has already been described. On opening the mouth, pustules are usually seen on the tongue, particularly between the little fringe at the back of its base and the glottis. The tongue may be "woody" in parts. There is more or less mucus or white material in the glottis and this may extend for some distance down the windpipe. On opening up the gullet numerous small pin-head-size pustules are invariably seen and from them white material may be squeezed with the fingers. These pustules may even extend to the crop.

Apart from the poorness of flesh, there are only two other features seen on post-mortem examination. The kidneys are usually speckled with little whitish spots, which are deposits of crystalline urates, and the tubes which lead from the kidneys to the vent (the ureters) are very dilated with urine containing much solid matter.

Treatment.

Treatment consists of the immediate supply of the lacking vitamin, all fowls on the deficient diet being given either green feed, carrots or cod liver oil. Not only obviously affected birds, but others which have not as yet shown the complaint should be so treated. The supply of the vitamin arrests the disease almost dramatically. Apart from the fowls so severely affected that their death may be expected within thirty-six hours, there are good prospects of saving all sick fowls, without any increase in the trouble and with rapid improvement of the whole flock within seven days.

The obviously sick fowls should be treated individually, each bird being given, by means of a dropper, one-quarter of a teaspoonful of reliable cod liver oil daily. Less seriously affected fowls and those not already showing symptoms should be given cod liver oil at the rate of 4 per cent. in the mash for the first week, and thereafter at the rate of 2 per cent. The oil should be added daily to the mash, as oil-containing mashes lose in efficiency on keeping. Poultry farmers should take care that pure and reliable cod liver oil is procured.

Green feed should be provided liberally as soon as this is available. It may be given at the same time as the cod liver oil, but it is advisable to make certain that the fowls receive the necessary vitamin by means of cod liver oil rather than to rely on all fowls eating the green feed offered.

Little or no treatment of the affected eyes is necessary. The white material within the eyelids may be removed and the eyes bathed with boracic acid solution.

As the disease is of nutritional origin, it will be realised that disinfection of houses and liming the runs is unnecessary.

Prevention.

The prevention of green feed deficiency disease is assured by the liberal supply of green feed (or carrots) or its substitute, cod liver oil. Various green crops are suitable for this purpose, the chief of which is lucerne. The lucerne should be chaffed fresh and given daily.

The amount of cod liver oil that should be given to prevent deficiency is not definitely known. When the oil is fed all the year round, 1 per cent. in the mash is sufficient. Where, however, a deficiency of green feed occurs the amount should be increased to 2 per cent. to ensure a sufficiency of the vitamin being obtained.

An Agricultural Bureau Scholarship at Hawkesbury Agricultural College.

The Agricultural Bureau of New South Wales has decided to award a scholarship tenable at Hawkesbury Agricultural College, Richmond, and covering the Agriculture Diploma course. The scholarship will be available for competition at the Intermediate Certificate examination, and, subject to special consideration being given to the candidate's merit, aptitude, fitness, and other qualifications necessary to become successful in agricultural work, will be awarded on the aggregate marks obtained in six subjects at that examination, including English, Mathematics I, and four others to be selected from specified groups.

It will be open to candidates who are not less than 16 nor more than 19 years of age on the date of commencement of the first session, and who are natural-born or naturalised subjects of the King. Candidates or their parents must, in addition, have had six months' continuous residence in this State immediately prior to the commencement of the first session. The scholarship is tenable for three years in the case of holders entering the first year, and for two years where they are qualified to enter the second year of the course, and will cover fees and text-books to the extent of £40 per annum. Any charges or expenses in excess of that amount will require to be met by the student.

The first session for 1933 will commence on 30th January next, and applications from persons desirous of competing for the scholarship must reach the Principal not later than the 5th of that month. Further particulars are obtainable from the Under Secretary, Department of Agriculture, Sydney, or from the Principal of the College.

"Even though 30 miles from the railway," wrote a recent correspondent to the Department, "we can still show a good profit. Last year we got 3,700 bags from 600 acres and have 450 acres of wheat this year. Only for the infomation gained from the *Agricultural Gazette* and the modern methods taught by the Department's instructors, we would have been forced out of farming by the depression."

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
P. Ubrihien, Corridgeree, Bega ...	133	2 Nov., 1932
W. W. Martin, "Narooma," Urana Road, Wagga ...	141	13 „ 1932
E. E. Winder, Wybong Road, Muswellbrook ...	46	14 „ 1932
Wagga Experiment Farm (Jerseys) ...	64	16 „ 1932
Wolaroi College, Orange ...	11	19 „ 1932
Lunacy Department, Callan Park Mental Hospital ...	31	20 „ 1932
E. E. McMullen, Springnook, Holbrook ...	32	25 „ 1932
Berry Experiment Farm ...	129	26 „ 1932
W. R. Boughton, Holbrook ...	22	27 „ 1932
J. B. Burtenshaw, "Sunnyside," Inverell ...	36	27 „ 1932
Parker Bros., Hampton Court Dairy, Inverell ...	74	27 „ 1932
W. K. Frizell, Rosenstein Dairy, Inverell ...	44	28 „ 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	99	29 „ 1932
J. L. W. Barton, Wallerawang ...	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood ...	8	3 „ 1932
Wollongbar Experiment Farm, Lismore (Guernseys) ...	119	3 „ 1932
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	9	3 „ 1932
A. N. de Fraine, Happy Valley Dairy, Inverell ...	9	6 „ 1932
W. Pigg, Redlands Dairy, Inverell ...	33	6 „ 1932
Lunacy Department, Morisset Mental Hospital ...	27	7 „ 1932
J. F. Chaffey, Glen Innes (Ayrshires) ...	58	15 „ 1932
Newington State Hospital and Home ...	100	17 „ 1932
W. T. Herbert, Racecourse Farm, Bega ...	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega ...	78	8 „ 1933
J. Davies, Puen Buen, Scone (Jerseys) ...	147	14 „ 1933
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	80	22 „ 1933
New England Experiment Farm, Glen Innes (Ayrshires) ...	41	28 „ 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	21	28 „ 1933
Bathurst Experiment Farm (Jerseys) ...	31	1 Feb., 1933
New England Girls' Grammar School, Armidale ...	29	3 „ 1933
Lidcombe State Hospital and Home ...	149	3 „ 1933
G. L. Genge, "Easton," Armidale ...	33	4 „ 1933
A. B. Finney, Fox Ground, Gerringong ...	29	11 „ 1933
George Rose, Aylmerton ...	3	23 „ 1933
Riverina Welfare Farm, Yanco ...	89	24 „ 1933
Department of Education, Yanco Agricultural High School ...	39	24 „ 1933
Mittagong Farm Homes ...	36	24 „ 1933
Liverpool State Hospital, Liverpool ...	72	3 Mar., 1933
Miss Brennan, Arankamp, Bowral ...	17	8 „ 1933
G. W. Young, "Boorganna," via Wingham ...	41	10 „ 1933
Lunacy Department, Kenmore Mental Hospital ...	80	27 „ 1933
P. M. Burtenshaw, Killean, Inverell ...	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra ...	20	6 „ 1933
A. D. Frater, "Fairview Dairy," Inverell ...	51	6 „ 1933
A. H. Pye, Loch Levan, Inverell ...	47	7 „ 1933
W. Newcomb, "Minnamurra," Inverell ...	72	7 „ 1933
Rydalmere Mental Hospital ...	77	7 „ 1933
St. Joseph's Girls Orphanage, Kenmore ...	11	13 „ 1933
St. Joseph's Convent, Reynold-street, Goulburn ...	3	14 „ 1933
St. Michael's Novitiate, Goulburn ...	4	14 „ 1933
Marion Hill Convent of Mercy, Goulburn ...	47	15 „ 1933
G. A. Parish, Jerseyland, Berry ...	93	21 „ 1933
Australian Missionary College, Cooranbong ...	72	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra...	76	6 „ 1933
Koyong School, Moss Vale ...	3	11 „ 1933
James Wilkins, "Jerseyville," Sandy Creek Road, Muswellbrook ...	40	12 „ 1933
Tudor House School, Moss Vale ...	31	13 „ 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	226	2 „ 1933
W. Hammond, Bellingen ...	77	16 „ 1933
Hurlstone Agricultural High School, Glenfield ...	44	22 „ 1933
E. C. Nicholson, Jillamatong, Corowa ...	180	23 „ 1933
St. John's College, Woodlawn, Lismore ...	47	23 „ 1933
Grafton Experiment Farm ...	271	14 July, 1933
William Thompson Masonic School, Baulkham Hills ...	37	20 „ 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 „ 1933
G. V. Ralston, "Porphyry," Seaham ...	98	21 „ 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook ...	37	17 Aug., 1933

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
A. L. Logue, Thornboro, Muswellbrook	36	17 Aug., 1933
E. W. Flower, Binna Burra	56	18 „ 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 „ 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 „ 1933
Sacred Heart Convent, Bowral	10	26 „ 1933
Lunacy Department, Parramatta Mental Hospital	12	1 Sept., 1933
Department of Education, Gosford Farm Homes	38	2 „ 1933
James McCormack, Tumut	98	9 „ 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 „ 1933
E. S. Cameron, Big Plain, Narrandera	31	26 Nov., 1933
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 „ 1934
St. Patrick's College, Goulburn...	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 „ 1934

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.

—MAX HENRY, Chief Veterinary Surgeon.

SUMMER SCHOOL FOR BEEKEEPERS.

ARRANGEMENTS are being made for the usual Summer School in Apiculture to be held at Hawkesbury Agricultural College from the 4th to the 19th January, 1933. The course will be open to persons of either sex over the age of 16 years, and the instruction will include practical work, lectures, and demonstrations, covering all the work necessary in apiaries.

The fee for the course will be £3 10s., including instruction as well as board and lodging. Students proceeding to the school by rail will be able to travel at concession rates where the distance each way to and from Richmond is not less than 25 miles. Students travelling by any of the North Coast Steam Navigation Company's steamers will also be entitled to a reduction in the fare.

The attendance at this course will be limited to twenty persons, and applications will be dealt with according to priority of receipt, preference being given, however, to those applicants who have not previously attended the school, should the number of applications received exceed twenty.

Applications for admission to the course must be forwarded to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, by not later than 19th December next. A prospectus containing full particulars of the course is obtainable from the Department.

"The utmost benefit and financial gain from advanced and progressive methods as applied to production can only be achieved when accompanied by an equal measure of advancement in business methods."—L. JUDD, Manager, Temora Experiment Farm, in a recent address to farmers.

Dairying Notes.

The Points of a Good Dairy Cow.

THE following qualifications may be said to be necessary in a good dairy cow, irrespective of the breed, though, of course, the breed societies have their own score cards, and the relative values given to the points vary with the breed:—

General Appearance.

Form.—Indicative of robust constitution; inclined to be wedge-shaped; lean appearance when in milk.

Quality.—Hair fine, soft; skin mellow, loose, medium thickness; secretion yellow; bone, clean, fine.

Temperament.—Alert, gentle.

Head and Neck.

Muzzle.—Clean cut; mouth large; nostrils large.

Jaw.—Square, evenly set.

Eyes.—Large, bright, full, mild.

Face.—Lean; quiet expression.

Forehead.—Broad between the eyes, dishing.

Ears.—Medium size, yellow inside, fine texture.

Horns.—Fine texture, waxy.

Neck.—Fine, medium length; throat clean; light dewlap.

Forequarters.

Withers.—Lean, thin.

Shoulders.—Light; oblique.

Legs.—Straight, short; shank, fine.

Body.

Crops.—Full, free from fleshiness.

Chest.—Deep, low; girth large with full fore flank.

Barrel.—Capacious, ribs broad, long, wide apart, well sprung.

Back.—Straight, strong; vertebrae open.

Loin.—Broad, level.

Flanks.—Broad, well filled out above, thin and arching below.

Hindquarters.

Hips.—Far apart, level.

Rump.—Long, wide, level; slight pelvic arch.

Pin Bones or Thurls.—High, wide apart.

Tail.—Long, thin; fine hair in switch; tail head neat.

Thighs.—Thin, long.

Legs.—Straight; shank, fine.

Mammary Development.

Escutcheon.—Spreading over thighs, extending according to class, covered with fine hair; secretions yellow.

Udder.—Long, attached high and full behind, extending far in front, and full, pliable; quarters even and free from fleshiness; body surface extensive; underline level.

Teats.—Wide apart, evenly placed, vertical, convenient size, regular.

Mammary or Milk Veins.—Large, long, branching; large milk wells.

The illustration below indicates the parts of a cow taken into consideration in judging her merits as a dairy animal, regardless of breed.

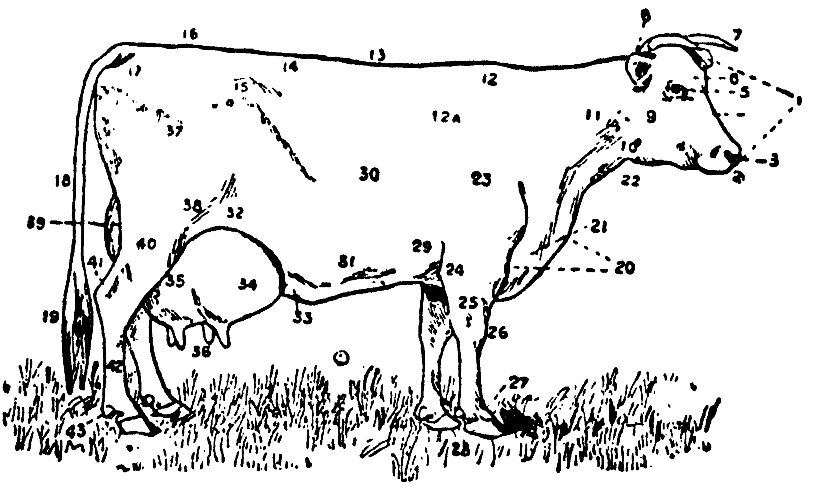


DIAGRAM OF COW SHOWING POINTS.

1. Head.	10. Throat.	18. Tail.	27. Ankle.	36. Teats.
2. Muzzle.	11. Neck.	19. Switch.	28. Hoof.	37. Upper thigh.
3. Nostril.	12. Withers.	20. Chest.	29. Heart Girth.	38. Stifle.
4. Face.	12A. Crops.	21. Brisket.	30. Side, or barrel.	39. Twist.
5. Eye.	13. Back.	22. Dewlap.	31. Belly.	40. Leg, or gaskin.
6. Forehead.	14. Loins.	23. Shoulder.	32. Flank.	41. Hock.
7. Horn.	15. Hip bone.	24. Elbow.	33. Milk vein.	42. Shank.
8. Ear.	16. Pelvic arch.	25. Forearm.	34. Fore udder.	43. Dew claw.
9. Cheek.	17. Rump.	26. Knee.	35. Hind udder.	

Progress of Dairying in Inland Districts.

For the last two years the dairying industry has taken precedence over wool and wheat and all secondary industries in regard to (*a*) value of production, (*b*) capital invested, and (*c*) numbers employed.

On the coast, where dairying is principally carried on, the weather was very dry from October, 1931, to March, 1932, writes the Director of Dairying (Mr. L. T. MacInnes) in his annual report, but in spite of this there was again a marked increase in production for the State as a whole. The output of butter (83 per cent. of total production of milk was made into butter) was a record, reaching 56,300 tons. The development of dairying over the wheat and sheep farming areas on the western slopes from the Victorian to the Queensland border was responsible for the greatest increase in production.

The increases in butter production were as follows:—

	Production.		Increase.	
	1930–31.	1931–32.		
	tons.	tons.	tons.	per cent.
Coastal Area ...	44,901	46,554	1,653	3·7
Inland Area ...	7,399	9,746	2,347	31·7
	52,300	56,300	4,000	8·0

The Recommendations of Silage.

A consideration that must weigh heavily in favour of silage with the dairy-farmer is the insurance it offers against the loss of valuable cows during a hard winter or a drought. Dairy herds that have taken years to build up are worth a great deal, and the numbers and the standard of a herd cannot be easily recovered when a drought ends. If losses occur periodically, the rate of improvement in the herd is very slow indeed, as the ground lost during one drought has probably hardly been regained when another period of scarcity comes along. It is the best cows that generally go off first if feed is scarce, as, owing to their high-producing disposition, they keep low in condition, while the poor yielders keep themselves in condition by using the feed to build up flesh and strength instead of making milk.

A silage crop is preserved in its green state, and it is therefore an excellent substitute for green grass. The succulence of the green crop is preserved and stimulates the milk flow, whereas dry feed tends to reduce it. Moreover, it is a convenient means of conserving fodder in the dairying districts.

Crops Suitable for Silage.

While many crops can be used for filling the silo, the most suitable in regard to feeding value and ease of handling are maize, sorghum, Sudan grass, wheat, oats, and barley. In the coastal districts maize and sorghum are undoubtedly the best, as they give a big yield per acre and are very easily converted into silage. Maize is the better of the two, being less subject to disease and producing fodder of higher quality. As a rule, the best crops for inland districts are wheat, oats, and barley, although in some localities, particularly in the north-west, maize is quite satisfactory. On the whole, however, for western districts preference may be given to the winter cereals, as the yield is more certain. There is not the slightest difficulty about making silage from any of these crops, provided the silo is of the right type and the crop is cut at the right stage, put into the silo immediately and is well packed down during the process. Leaflets giving details of the process using either overhead concrete silos or pits, as well as of the conserving of surplus pasture growth in silage stacks, may be obtained free of charge on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

How to Treat a Case of Bloat.

Bloat, or hoven, is a condition that results from cows eating succulent foods under certain conditions which cause the formation of large quantities of gas in the rumen or paunch, and in consequence a swelling of the left flank. It is most often seen (*a*) when cattle are turned hungry on to such succulent green food as lucerne, clover, etc.; (*b*) when cattle used to dry feed are suddenly changed on to green, soft food; (*c*) when travelling cattle are allowed access to large amounts of green food, such as variegated thistle; (*d*) when cattle gorge themselves on wet grasses or herbage; and (*e*) when cattle are fed on roots or potatoes under certain conditions. Some animals appear to be more subject to hoven than others.

Every effort should be made to prevent the occurrence of hoven in stock. When feeding lucerne and clover to animals not used to these crops, the animals should be put on gradually. If lucerne is fed in a wet state, or after heavy rain—when it is soft and juicy—it will almost always cause trouble, and cattle should, therefore, be kept off it until it is drier.

Keeping the mouth open with a gag, or a piece of wood, until the beast has belched most of the gas by mouth will be useful in mild cases. The internal administration of 1 oz. of bicarbonate of soda, and 1 oz. of ginger, is sometimes useful, and it may be repeated in a few hours—if necessary. In a bad case the most effective treatment is the puncture of the paunch. This is done on the left side in the flank—at a point equidistant from the last rib, the edge of the loin bones, and the angle of the haunch. The correct instrument for this purpose is trocar and cannula. The cannula is a tube through which passes a sharp-pointed instrument—the trocar. This instrument is thrust into the rumen, and the trocar is withdrawn, leaving the cannula in place, and through this the gas escapes. In case of emergency a knife may be used in the same way, the gas escaping through the cut, but complications may set in and cause death if this is not done expertly. After the gas has escaped the animal might be given a dose of linseed oil (1½ pints), and turpentine (1 tablespoonful). The mixture should be well shaken up while being given.

The Utilisation of Milk.

It is perhaps doubtful, states a report on dairy produce just issued by the Empire Marketing Board, whether the greater part of the world's milk supply available for human consumption is consumed as fresh milk or as butter and cheese.

In the United Kingdom liquid milk consumption accounts for much the greater proportion of the output, representing about 70 per cent. of the total, while butter and cheese account for 19 and 7 per cent. respectively. But the United Kingdom is a large importer of butter and cheese. In the United States, where home production and consumption more nearly balance, it has been estimated that 50 per cent. of the milk available for human consumption is used for household purposes, butter-making takes 38 per cent., and cheese, condensed milk and ice cream each nearly 4 per cent. In Canada liquid milk accounts for rather over one-half the aggregate value of dairy production, butter representing about 32 per

cent., cheese 10 per cent., and ice cream and preserved milk accounting for most of the balance. Countries such as New Zealand, Australia, Denmark and the Netherlands, which export large quantities of butter or cheese, devote the greater part of their milk output to these commodities.

World Production and Consumption of Margarine.

The following statement in regard to current developments in the butter and margarine situation throughout the world was issued by the U.S.A. Department of Commerce at the end of July:—

"World production and consumption of margarine is limited almost entirely to the United States and northern and central Europe. In Canada, the manufacture or sale of margarine continues to be prohibited by law. In Australia and New Zealand the industry has scarcely as yet gained any foothold. In southern Europe, Argentina, and in those regions generally where the use of liquid vegetable oils is established, custom continues to operate against the manufacture or consumption of margarine as such. In Russia, abundant supplies of butter on the peasant holdings and the comparative scarcity of industrial centres has prevented, at least until very recently, the establishment of a margarine industry of any importance. References have been made in various market reviews to attempts on the part of the Russian Government to obtain margarine supplies in order to release great supplies of Russian butter for export, and the construction by the Soviet Government of a margarine factory in Leningrad early in 1929 is reported.

"During the last two years margarine consumption (and production) in Europe as in the United States has been checked in comparison with butter consumption. Indications are that there has been some decline absolutely as well as in relation to the consumption of butter. Germany is a possible exception. In that country, prevailing economic conditions have apparently caused the production and consumption of margarine to be well maintained during 1931, despite the low level of butter prices. Recent reports indicate that margarine sales in Germany have been stable with prospects for a continuance of this situation in the near future.

"In the Netherlands, which is the centre of the European margarine industry, and probably the only country exporting important quantities of both butter and margarine, the cheaper descriptions of butter have recently been imported in increasing volume and retailed at prices competing effectively with margarine. Consumption of butter is reported to have increased from 13.0 lb. per capita in 1929 to 14.3 lb. in 1930, while margarine consumption declined slightly from 20.3 lb. to 19.6 lb., and the shift is thought to have been accentuated since 1930.

"In Great Britain, one of the largest organisations dealing in butter and margarine is reported by the British Ministry of Agriculture and Fisheries to have had its sales of margarine adversely affected by the extremely low prices prevailing for butter. Inquiries carried out by the Empire Marketing Board in Nottingham are reported to have shown that in that city a decline in margarine sales of 19 per cent. occurred between July, 1928, and July, 1931, while butter sales increased by 15 per cent. in the same period."

Bordeaux Spray Versus Dusting Powders for the Control of Vine Diseases.

H. L. MANUEL, Viticultural Expert.

TRIALS were again conducted in 1930-31 and 1931-32 to compare the efficiency of copper-containing dusts and Bordeaux mixture spray for the control of black spot and downy mildew of the vine, and the results having definitely confirmed those of previous years, the experiment has now been terminated.

Mr. J. M. Arthur, Orchardist at Hawkesbury Agricultural College, reported that the 1931-32 season was an excellent one for the trial at Richmond, where, in addition to the plots treated with dust and Bordeaux spray respectively, one plot received Bordeaux at the commencement of the season as well as an application of dust later.

Vines used in a Trial at Narara.

On the Left.—A vine which was sprayed with Bordeaux mixture (6–4–50) on 27th October, 1930, and dusted with powder on 28th November and 22nd December, 1930. Note the defoliation due to downy mildew.

On the Right—A vine sprayed with Bordeaux mixture (6–4–50) on 27th October, 28th November and 22nd December.

The plots contained the varieties Gordo Blanco, Black Hamburg, and Black Muscat, and in each 198 vines were treated, while twenty were left untreated for comparative purposes. The Black Hamburg and Black Muscat varieties did not develop any disease on either treated or untreated vines, and therefore the following particulars regarding disease apply only to the vines of the variety Gordo Blanco.

Vines in the Hawkesbury College Trial.

On the Left.—Vine sprayed with ordinary Bordeaux mixture.

In the Centre. Vine which received applications of dust.

On the Right.—A check vine neither sprayed nor dusted.

The yields obtained from each of the plots were as follows:—

Plot and Treatment.	Net Weight Harvested.	Average Weight per Vine.	Weight of Trimmings (Waste).	Percentage of Waste.
	lb.	lb.	lb.	
A. Bordeaux mixture as required ...	1,635	8·2	304	12·3
B. Copper-containing dust as required ...	556	2·8	232	41·7
C. Bordeaux mixture (14th October, 1931) plus dusting, as required	824	4·1	265	32·1

In Plot A the majority of the waste was caused through scalded or bird-pecked berries, and very little black spot was present; in fact, it was very difficult to find any disease-affected vines. In Plot B, however, the majority of the waste was caused through shrivelling and black spot in the bunches; the berries were more shrivelled than in Plot A, due to partial defoliation of the vines as the result of black spot infection and dust injury. In plot C the waste also consisted principally of diseased and shrivelled berries, but was less in amount than in Plot B; *i.e.*, less disease developed on the fruit and foliage, but the vines were partly defoliated by the black spot and dust injury.

In none of the plots could downy mildew be considered at all bad; only the untreated vines in plots B and C developed the disease—and these only to a slight extent.

From the results of this test at Hawkesbury College it is quite evident that dusting is not a control for black spot, and on the other hand it weakens the vines, by burning, to such an extent that the bunches and foliage are seriously affected, the bunches being scraggy, with the berries small and scalded, while severe dropping of the foliage results.

The Superintendent of Narara Nursery, who also conducted trials, reported that the dusted vines did not have the same healthy foliage as the sprayed vines, while they dropped the foliage much earlier and carried more dead wood at the ends of the canes.

Even though dusting is a quicker operation, the cost per acre is much greater than that of spraying, and growers would be advised to adhere to the use of the ordinary Bordeaux spray.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows: these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Murwillumbah (T. M. Kennedy) ... Nov. 16, 17.

1933.

Newcastle (P. Legoe)	Feb. 22 to 25	Taree (C. A. Jackson)	Mar. 30, 31, Apl. 1
Rydal (H. Murray)	Mar. 10, 11	Kempsey (E. E. Mitchell)... ...	April 26, 27, 28
Mudgee (T. P. Gallagher)	„ 14, 15, 16	Gresford (A. R. Brown)	„ 28, 29
Bellingen (J. F. Reynolds) ...	„ 21, 22, 23	Casino (E. J. Pollock)	May 16 to 18
Dungog (W. H. Green)	„ 30, 31, Apl. 1	Narrandera (J. D. Newth)... ...	Oct. 3, 4

Tobacco Notes for November.

C. J. TREGENNA, Tobacco Expert.

Transplanting the Seedlings.

DURING this month tobacco seedlings will be ready to be transplanted from the seed-beds to their permanent positions in the plantation, which should, as the result of careful preparation in the past few months, be in good condition for the continued development of the young plants. When the plants are from 6 to 8 inches in height and well hardened off, they are ready for setting out. The best plants are those which are the most vigorous looking, and with short, broad leaves. Plants which are stunted and yellow, and which have long, pointed leaves, should not be used.

If the beds are dry and hard they should receive a good soaking some little time before the plants are drawn, so that as little damage as possible is done to the root system. The earth adhering to the plants should not be interfered with more than can be helped. The best way to remove the plants is with a three-pronged fork. If the tap-root is long, it should be trimmed off with a pair of scissors to about 2 inches. The less handling the plants have the better, and after they have been drawn they should be placed, root downwards, in a cool place, and kept covered with wet bags. Only the plants that can be set out on the same day should be drawn at the one time.

It may here be stated that where the aim of the grower is to produce a fine-textured leaf, the plants should be set out close together, and although past experience must be taken as a guide, it will generally be found that a spacing of 20 to 24 inches in rows 3 feet apart on light sandy loam will not induce heavy growth and coarse texture. This distance of 3 feet between the rows will allow of horse cultivation, and thus lessen labour.

The ideal weather for planting out is just before and during rain, so that the roots of the plants may have very little check, and growth may be established as soon as possible. Unfortunately, however, weather conditions do not always suit the planter, and he may be forced to set out during dry weather. In this case holes should be made and filled with water, and the plants carefully put in and the earth well packed round the roots. Care should be taken that the roots are not doubled up, and that the hole is properly filled with earth. A simple test of planting is to pull the tips of the two top leaves gently in an upward direction, and if they break off in the fingers the plants are right. Another method where irrigation is not carried out is to make a hole close to the plant and fill with water, and then cover up to prevent evaporation.

If the weather continues hot after transplanting, the plants should be shaded with grass. Paper folded in the shape of a tent and held down by two clods of earth is also very effective. It may be necessary to water, and, if so, it is best done early in the morning or about an hour before sundown.

Plants which have struck well usually start growing in about ten days, and the covering may be removed.

If irrigation is carried out, a good plan is to turn two shallow furrows together with a light plough, and run the water so that the ridge gets a good soaking some little time before transplanting. The plants should then be set out on the shady side of the ridge, care being taken that the stem and leaves are high enough above the water to avoid being submerged. As soon as possible after transplanting it is advisable to run water through again to set the earth well around the bottom of the roots. After five or six days the crust around the young plants should be lightly stirred and broken.

The Tobacco Excise Law.

With the great influx of new growers into the tobacco-growing industry in recent years, it is quite possible that some of them are not fully conversant with what is required under the Commonwealth Tobacco Excise Law.

A £20 penalty is provided for those who grow tobacco without first obtaining registration. Leaf may be grown only on the areas in respect of which the grower is registered. The owner or the lessee of the land is the proper person to be registered. Share-farmers or partners are covered if the owner or the lessee be registered. Application forms are obtainable from the Collector of Customs, Sydney, who effects registration when application is made. No fee is charged for registration.

A grower can store his leaf on his own premises, but not elsewhere without the Collector's permission. A registered grower may sell leaf of his own production only. He is not permitted to buy leaf from any other person, and may sell leaf only to licensed dealers and manufacturers. No person other than a registered dealer or a licensed manufacturer may trade in leaf. A grower must keep an account of all leaf produced and disposed of, and must furnish a return setting out his operations up to 30th June each year. This return must be forwarded to the Collector of Customs not later than 15th July following. Total failure of a crop must be notified in the return. A grower who ceases to grow must at once notify the Collector or continue to furnish annual returns.

No person, other than a licensed manufacturer, is permitted to prepare tobacco for smoking, under a penalty of £100. Hence, a grower or any other person who prepares tobacco, even for his own smoking, renders himself liable to a heavy fine. Heavy penalties are prescribed for failure to conform to the law in any of the above matters.

Infectious Diseases Reported in September.

The following outbreaks of the more important infectious diseases were reported during the month of September, 1932 :—

Anthrax	Nil.
Blackleg	3
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	5
Swine fever	Nil.
Contagious pneumonia	2
Necrotic enteritis	2

—Max Henry, Chief Veterinary Surgeon.

Sodium Chlorate.

Its use as a Weedicide.

Sodium chlorate has been under departmental trial as a weedicide for some years, but such questions as rate and time of application and other problems involving economy of use called for investigation. The Department is now in a position to issue fairly definite instructions regarding the employment of this chemical for weed destruction, and these are set out in the following article.

Sodium chlorate is a white crystalline salt that is readily soluble in cold water, and is best applied in solution in the form of a spray. It can be used in the dry state, but this method is slower in action and less economical of material, and should only be used when it is desired to treat small patches of a few square feet, or when spraying equipment is not available.

The effective strength of the solution will vary with different weeds and their stage of growth. For most weeds, particularly deep-rooting ones, a 10 per cent. solution is required, prepared by dissolving the sodium chlorate at the rate of 1 lb. in 1 gallon of water. Many weeds can be destroyed with much weaker solutions, even as weak a dilution as 1 per cent. The rate of application will, of course, vary according to the amount of vegetation. One hundred gallons of solution is usually sufficient to treat 1 acre of weed growth, but with weeds that make heavy growth the quantity should be increased to about 150 gallons.

Method of Application.

All the leaves of the weeds should be well moistened with the solution, and, as the spray is more effective and economical of material when in the form of a mist, spraying machines on the compressed air principle are the most suitable for its application. A knapsack sprayer of 2 to 5 gallons capacity will serve the purpose for the spraying of small patches, but a barrel sprayer mounted on a waggon or truck is more convenient for larger areas. When it is desired to treat several areas, power sprays as used in commercial orchards could be adapted for the purpose and would be very efficient.

For the destruction of deep-rooting weeds it is generally necessary to make two sprayings, any new growth made by the plants being sprayed about six to eight weeks after the first spraying. Unlike that of many other weedicides, which rapidly kill the top growth but do not destroy the roots, the action of sodium chlorate is very slow; at first comparatively little effect is noticed, but the plants gradually wither, the roots become exhausted, and finally the whole plant dies.

The sprayed areas should be left undisturbed for a period of three months after spraying.

Best Time for Treatment.

The best time for spraying weeds is, as a rule, when they are in full bloom, and the action of sodium chlorate is more rapid when the air is moist. Rain following a short time after spraying does not hinder the action of the spray; in fact, in some instances the kill has been more complete when rain followed within a few hours of spraying. The chemical is not so effective on weeds which are continually in the shade, and the best results are obtained where spraying is done in direct sunlight.

As sodium chlorate is as injurious to other growing plants as it is to weeds, care is required not to let the spray solution come in contact with other plants that it is not desired to destroy, nor should it be used in close proximity to shallow-rooting plants, as it is likely to penetrate the soil and affect the root systems. Any spray apparatus that has been used must be thoroughly rinsed with plenty of water to remove all traces of the chemical before being used to spray fruit trees, etc.

The quantity of sodium chlorate used for the spraying of weeds has only a temporarily injurious effect on the soil. It would affect crops sown very soon after spraying; the period that must elapse before it is safe to sow crops will depend on the amount of rainfall subsequent to spraying. It has been found that crops can be safely sown during the season succeeding the application.

Precautions against Stock Poisoning and Fire.

Sodium chlorate is poisonous to stock if taken in sufficient quantity, and, although with the relatively small quantity of chemical used for spraying, there is little danger of stock being harmed by eating the sprayed vegetation, there is nevertheless a possibility that they may receive an overdose by licking recently-sprayed foliage. For safety, stock should be removed from sprayed areas until the weeds have been well washed by rains, and care should be taken that stock do not have access to unused spray, which they will readily drink.

Materials which burn easily, if sprinkled with a solution of sodium chlorate, are rendered more inflammable, and fine straw, clothing, etc., that have been moistened with the solution and allowed to dry may be ignited by friction or from a spark, and thus constitute a fire menace. It is therefore inadvisable to prepare the solution inside sheds, and if the clothing becomes saturated with the solution, it should be thoroughly rinsed before being allowed to dry. Leather boots also absorb the solution readily and are not easily cleaned; therefore, if large quantities are being used, it is preferable that rubber boots be worn. The wooden parts of vehicles used for conveying the solution should be painted to prevent absorption of the chemical.

Pumpkins and Squashes.

Classification and Description of Varieties.

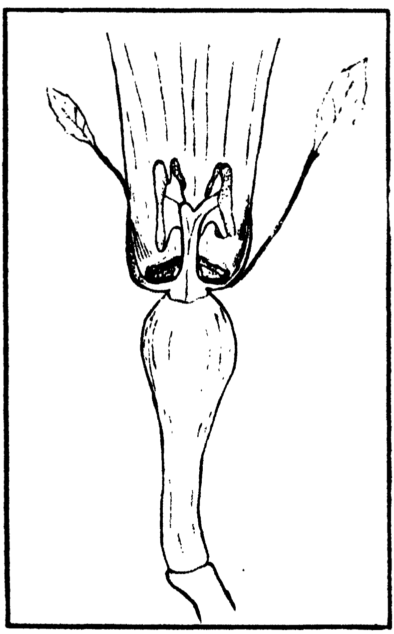
[Concluded from page 752.]

W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeder.

In previous instalments of this article, pumpkins (*Cucurbita maxima*) and marrows and squashes (*Cucurbita pepo*) have been described and illustrated. In this issue Mr. Darragh deals with grammas and rios or pie pumpkins, which belong to the species *Cucurbita moschata*.

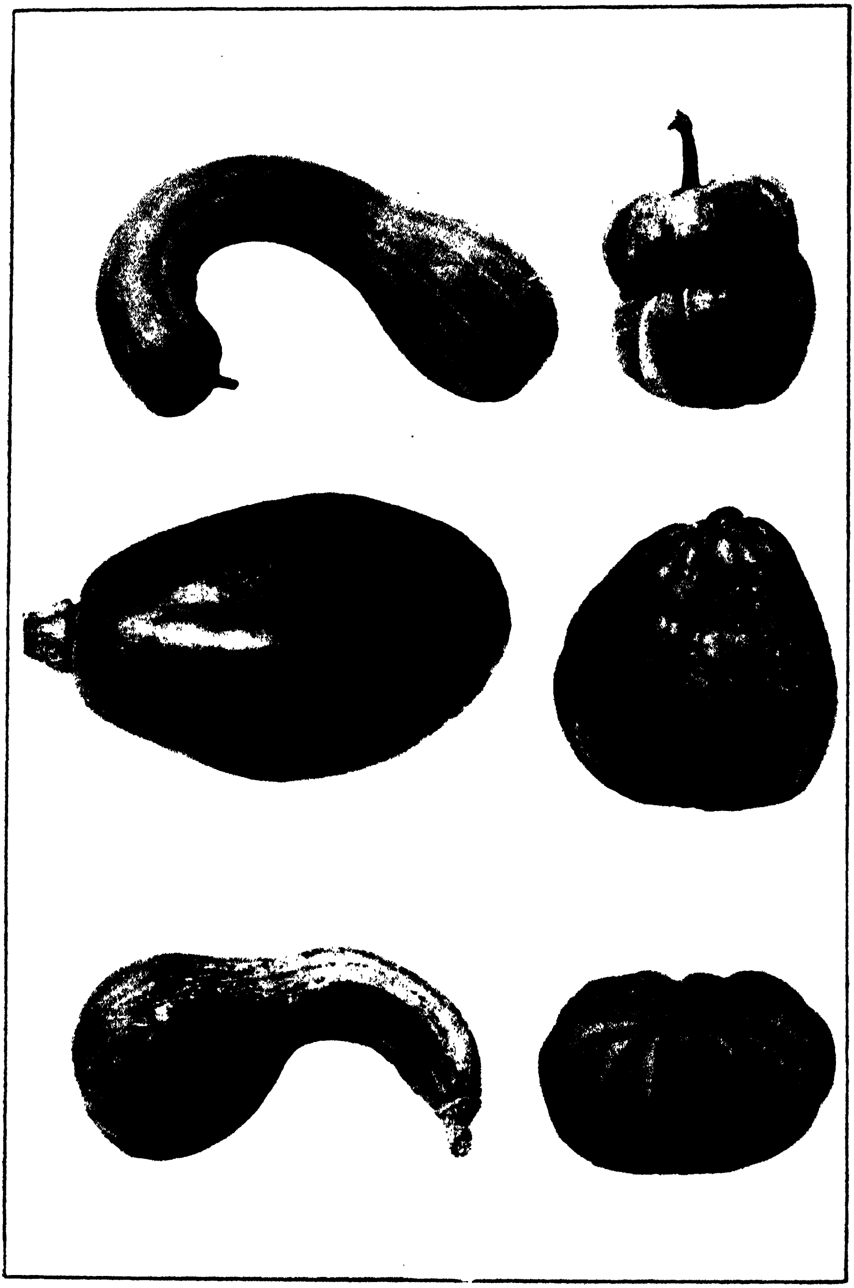
Part 3.—Grammas and Rios or Pie Pumpkins.

To the species *Cucurbita moschata* belong the varieties commonly called grammas, rios, or pie pumpkins. It is proposed to refer to these varieties as grammas.



Section of Female Flower of *Cucurbita moschata*.

C. moschata Duch. may be described as follows:—Plants running; stems five-sided, some nearly cylindrical with slight ridges, often grooved; stems, leaf blades, and leaf stalks usually soft hairy, rarely rough hairy, usually covered with dense whitish hair; leaf blades somewhat rounded yet with three to five lobes, but not deeply lobed; silvery spots occur at intersec tion of veins, rarely absent. Staminate flower stalks five-sided, but nearly cylindrical; pistillate flower stalk five sided and grooved, sometimes cylin drical, but then enlarged; unopened flower buds pointed; corolla tube flaring to bell-shaped, lobes intermediate between *C. maxima* and *C. pepo*. Flowers larger and brighter than those of other species; staminate calyx cup-shaped, pistillate calyx disc-shaped, sepals long and rather flattened, with or without leaf-like terminations. Fruit stalks five-sided and grooved or largely swollen and cylindrical, hard or soft at maturity; attachment to fruit enlarged; fruit shell hard or soft when fully ripe. Seed cavity large or small; seed colour greyish, white-margin of seed thickened,



Varieties of Grammas, Rios or Pie Pumpkins.

Bugle Gramma. Golden Nugget.
Papaw Gramma. Pear Gramma.
Japanese Pie Gramma. Large Cheese.

deep in colour and of more roughened texture than body of seed and of a more fibrous nature; seed scar rounded or horizontal, rarely slanting.

This species is distinguished from *C. pepo* and *C. maxima* by the fibrous nature of the margin of the seed coat, the slightly lobed leaf blades which show silvery markings, and by the swollen attachment of the peduncle to the fruit.

The group contains a variety of types which differ in size and shape. The flesh colour is usually cream to orange, sometimes deepening to orange-red. Most varieties can be used as pie pumpkins, though the close-grained sorts are the best for this purpose, whilst the coarser sorts can be used for stock food.

The Chief Varieties Described.

Bugle Gramma.—Fruit large and with long curved neck; the blossom end is swollen and contains the seed, and the neck is long and smaller in size, curved and solid; size, 30 inches by 5 inches; weight, 10 to 20 lb. The skin

A Gramma of Jonathan Variety.

is of dull golden-brown colour and smooth, and the flesh is orange-coloured and close grained. The fruit stalk is slender and flaring at attachment. Used largely as a pie pumpkin.

Mammoth Golden Cushaw.—Synonymous with Bugle Gramma.

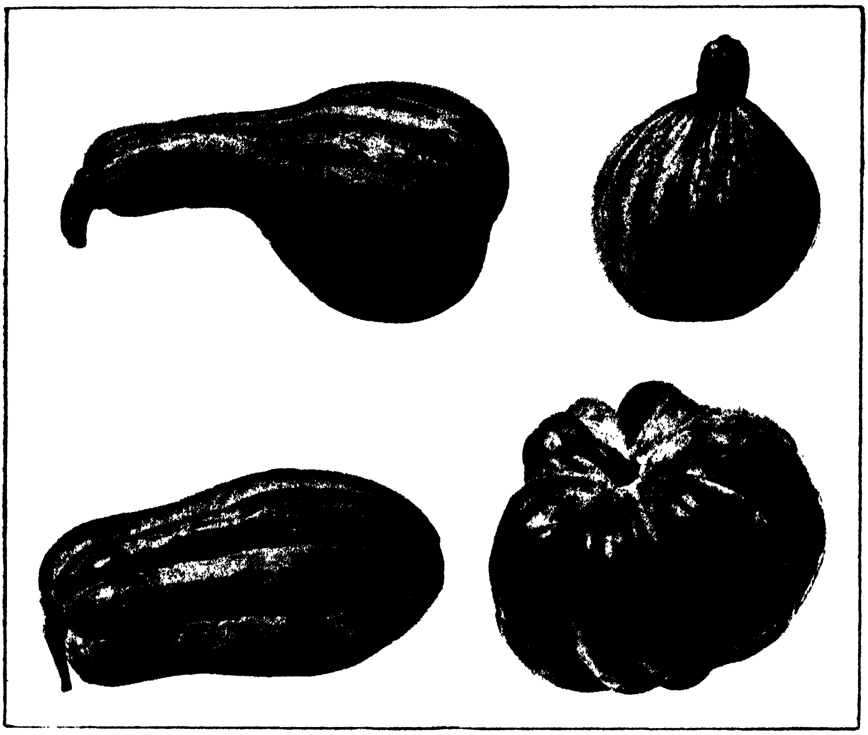
Golden Nugget.—Medium size, and of very characteristic shape; size, 12 inches by 8 inches; weight, 10 to 15 lb.; stem end solid; blossom end with seed cavity, but not large. The skin is light-brown and roughed; flesh deep orange, fine grained; shell hard at maturity; fruit stalk slender and flaring. A prolific bearer, of excellent flavour, and an excellent pie variety.

Pear Gramma.—Large, pear-shaped, hollow; size, 14 inches by 9 inches; weight, 10 to 20 lb. The skin is smooth, light-brown in colour, slightly

grooved; flesh deep orange, somewhat coarse; fruit stalk slender and flaring. Used as a pie pumpkin.

Papaw Gramma.—Fruit small in size and shaped like a papaw; size, 9 inches by 4 inches; weight 3 to 5 lb. The fruit is elongate and slightly ribbed; skin mottled green before fully mature, golden-brown at maturity; flesh deep orange-red in colour and fine grained; fruit stalk slender and flaring. Can be used as a vegetable or pie pumpkin.

Japanese Pie.—Fruit medium to large, with curved neck; size, 12 inches by 6 inches; weight, 9 to 12 lb.; skin dark-green; slightly warted. Flesh, pale cream and coarse. Fruit stalks large and swollen. Used as a pie pumpkin; not a good keeper.



Varieties of Grammas, Rios or Pie Pumpkins.

Striped Cushaw. Trombone.
Giant Long. Mammoth Round.

Large Cheese.—Fruit large and flattened, very slightly grooved; size, 14 inches by 8 inches; weight, 9 to 15 lb. The skin is creamy buff in colour, and smooth; flesh salmon-yellow in colour and coarse grained; fruit stalk slender and flaring. Used as a canning pumpkin.

Jonathan.—Fruit large, with short curved neck; blossom end very large and hollow, stem end much smaller; neck short, slightly curved, and solid; size 15 inches by 9 inches; weight, 10 to 20 lb. The skin is smooth, white

in colour, and may show green hatched stripings. Flesh pale cream and coarse; peduncle very thick and swollen. May be used as a pie pumpkin, but not a good quality one.

Seedless Marrow.—Synonymous with Jonathan.

White Cushaw.—Synonymous with Jonathan.

Trombone.—A medium-sized fruit, pear-shaped to spherical, hollow; size 10 inches by 10 inches, weight 10 lb. The skin is smooth and white in colour with faint green markings; flesh very pale and coarse, peduncle much swollen. Cattle type.

Striped Cushaw.—Fruit large, with short curved neck; blossom end large and hollow, stem end smaller. This variety is similar in shape to Jonathan, but differs in skin colour; size, 18 inches by 10 inches; weight, 10 to 20 lb. Flesh orange in colour, coarse grained; skin smooth and creamy, with green hatched stripes. Fruit stalk large and swollen. Cattle type.

Mammoth Round.—Fruit very large and round, deeply furrowed; size, 18 inches by 15 inches; weight up to 60 lb. The skin is smooth and golden-brown; fresh orange in colour, and coarse; fruit stalk slender and flaring. A cattle type.

Giant Long.—Fruit long and cylindrical, slightly grooved; size, 22 inches by 9 inches; weight, 20 to 30 lb. The skin is smooth, golden-brown in colour, flesh orange in colour, coarse; fruit stalk slender and flaring. A cattle type.

AUSTRALIAN CITRUS FRUIT IN CANADA.

IN a report on the shipment of citrus fruit he accompanied to Canada as part of his investigation into citrus fruit problems, Mr. C. G. Savage, Director of Fruit Culture, stated that the shipment, which consisted of 3,814 cases of oranges and 776 cases of lemons, arrived at Vancouver on 12th August in excellent condition, the fruit being clean and bright and the quality good. As far as could be gathered from an inspection on the wharves no waste had occurred. The Government Fruit Inspector and the selling agents' representative both remarked upon the fine appearance of the fruit, which they considered was equal to the best of the Californian pack. At the time of writing the oranges were being sold in the Vancouver shops at a price equivalent to about 2d. each. Good publicity was given the shipment, and in many instances the fruit was being displayed in the shop windows alongside Californian Late Valencias, which, it was stated, were certainly showing it off to advantage.

While the lemons did not carry quite as well as the oranges, the fruit mostly had a bright appearance on arrival and was favourably commented upon. The larger lemons were found to carry better than the smaller fruit. The selling agents intimated that there was a better market for lemons than for oranges, and they expected to sell the whole of the shipment of the former at a good price, straight from the wharves.

Cool Storage of Cherries.

CHERRIES can be cool stored quite successfully from four to six weeks (they have even been stored for as long as eight weeks), depending on their condition when placed in the cool store. However, it has been found that there is generally no advantage in storing later than from Christmas to New Year, as other stone fruits are then becoming so plentiful that the price of cherries is likely to drop.

The following points on the cool storage of cherries have been supplied by Mr. W. E. Barrett, proprietor of one of the cool stores in Orange, who has been very successful in the cool storage of cherries and other fruits for some years past.

The best temperature at which to store cherries is between 30 and 32 deg. Fahr., and, if possible, it should not be allowed to go above 33 deg. Fahr.

Cherries for cool storage should be ripe, but not soft ripe. It is preferable for them to be slightly under-ripe rather than overripe. The cherries should be placed in the cool store as soon as possible after picking.

The main varieties, such as Early Lyons, Florence and St. Margaret, all cool store equally well. Bigarreau Napoleon stores well enough, but it "browns" in cool store just as it does where touched when packed fresh. The variety Early Lyons will store, but, except to avoid a short glut, it is generally useless to store the early varieties, as when held they have to compete with the later varieties, which are generally preferred on the market.

It is preferable to use lining paper around the sides, top and bottom, but end papers need not be used.

Provided they are not stacked in a truck with a quantity of other fruit which is hot (that is, fruit which has not been in cool store or pre-cooled) the cool stored cherries carry equally as well as those freshly picked.

Mr. Barrett also states that he finds it best to store in half cases, handling the fruit as little as possible (of course rejecting any split or otherwise damaged cherries), and only filling the cases sufficiently to allow the lids to be tied down without any undue pressure on the fruit. When removed from store it is necessary to re-pack the cherries for market, rejecting any imperfect fruit.

Some orchardists pack their fruit ready for market before placing in the cool store, but the pressure used when nailing on the lids damages some of the fruit, especially near the ends of the box, and the damaged fruit will go mouldy during storage. It is only advisable to pack ready for market before storing if it is quite certain that the fruit is not to be held longer than one week.

The first indication of the cherry deteriorating in cold store is the drying of the stalk and its subsequent separation from the fruit.

Amended Regulations for Fruit Fly Control.

THE regulations in connection with the control of fruit fly have been amended as follows:—

As formerly, all fallen fruit must be collected at least once in every period of twice days, but three alternative methods are now prescribed for dealing with infested and waste fruit, namely, boiling, burning, or placing the fruit in a pit covered in a manner that will prevent the escape of any fruit flies from the pit. Previously some growers allowed up to three days to elapse after the fallen fruit was gathered before dealing with it in the manner laid down in the regulations, but it is now definitely provided that the requisite treatment must be carried out immediately the fallen fruit is collected.

All Seville oranges of the intermediate crop must be removed from the trees by not later than the first day of July, as formerly required, but the date for the removal from the trees of all main crop mandarins and Seville oranges has been extended from the first to the thirtieth day of September. It will be observed that mandarins have been included, and the reason for this is that it is considered that the majority of mandarins remaining on the trees after the end of September are small, and, on the whole, unsuitable for marketing, and therefore provide a medium for the development of fruit flies. Provision is made for the Minister to grant exemption from compliance with the above-mentioned requirements in respect of any crop or portion thereof for such period and under such conditions as he may specify.

To meet growers who desire to employ trapping in lieu of spraying as a means of destroying fruit flies, the former has been included as an alternative method. It has also been found desirable to include persimmon trees in the treatment, and to increase the quantity of foliage poison spray to be applied. In this direction the proclamation provides that every owner and every occupier of land or premises within the boundaries prescribed therein shall, at least once in every period of seven days for at least five weeks immediately preceding the harvesting or ripening, whichever is the earlier, of any pome, stone, loquat, guava, or persimmon fruits, apply to the foliage of such trees not less than 10 fluid ounces of a poison spray made according to the formula set out in the proclamation, or such other spray as may at any time be decided upon by the Department. The formula prescribed is 1 gallon of fruit syrup made by boiling 5 lb. of fruit in 1 gallon of water, and adding 3 gallons of water. 4 lb. of molasses or treacle, and 5 oz. of arsenate of lead powder.

The alternative method of treatment provides for a fruit fly trap to be attached to one tree in every ten or less number of each variety of pome, stone, loquat, guava, or persimmon tree for a period of at least five weeks

immediately preceding the harvesting or ripening of the fruit, whichever is the earlier. Each trap must be baited with at least 6 fluid ounces of freshly-made lure, and has to be kept so baited during the prescribed period. The lure is to consist of a fruit syrup made by boiling 5 lb. of apples, pears or peaches in 1 gallon of water, or a mixture of one-eighth fluid ounce of synthetic vanilla, one-half ounce of household ammonia, and 6½ pints of water, or such other formula as may at any time be decided upon by the Department. The trap is to consist of a spherical glass bowl approximately 7 inches in diameter and 4½ inches in height, having an opening at the base to permit of the entry of the fruit flies.

A leaflet containing the amended regulations, and giving full details concerning fruit fly control, is available free of charge from the Department of Agriculture, Box 36A, G.P.O., Sydney.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son, Carlingford	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson, Ermington	2,000	2,000	700	1,000	500	6,200
Swane Bros., Ermington	1,000	1,000	250	500	500	3,250
Geo. McKee, Ermington	1,000	2,000	...	...	...	3,000
C. Langbecker, Bundaberg, Queensland	...	750	...	...	250	1,000
F. Ferguson and Son, Hurstville	2,000	3,000	...	...	...	5,000
A. T. Eyles, Rydalmere ..	3,000	2,000	...	...	...	5,000
R. Hughes, Ermington ..	500	500	250	500	1,000	2,750

—C. G. SAVAGE, Director of Fruit Culture.

Two Fungous Diseases of the Loquat.

W. A. BIRMINGHAM, Assistant Biologist.

"Fleck" Disease.

DURING November, 1931, loquat leaves were submitted by a suburban nurseryman to the Biological Branch for examination. The leaves were badly marked with purplish-brown, more or less circular spots (generally localised) with light centres (Fig. 1), the spore-bearing pustules (Acervuli) appearing as minute points in the centre. The spots in some cases ran together forming large diseased areas, resulting in a restriction of growth of that part of the leaf, with malformation (Fig. 2). The stems of the plants were also attacked by the fungus, which produced badly cankered areas, as shown in Fig. 3. The fungus responsible was *Entomosporium* sp. So far, affected fruits have not been met with in this State (Fig. 4).

Fig. 1.—Portion of Loquat Leaf, showing Typical "Fleck" Spots.

Fig. 2.—Loquat Leaf, showing Malformation due to "Fleck."

A fungus, *Entomosporium maculatum*, is responsible for considerable damage to pears in some seasons on the Northern Tablelands of New South Wales, especially at Kentucky. The fruit and leaves are badly attacked, the fruit being greatly depreciated in value and the trees seriously defoliated. This disease is known as "fleck," "leaf-blight," and "scald."

Putterill ([9]) has reported a blight of loquats from a locality in Cape Province and other parts of the Union of South Africa, caused by ***Entomosporium*** sp., and which is associated with scab (*Fusicladium*). His description of the symptoms is as follows:—"Small, circular, reddish-brown spots, surrounded by a yellow zone, appear upon the leaves and small circular, shiny black spots appear upon the fruit" (Fig. 4). He states further: "A similar, if not the same, species of entomosporium (*E. maculatum*) causes leaf blight of quince and pear, considerable damage having been recorded in South Africa. The control measures advocated for scab should apply equally well for this blight."

Fig. 3.—Portion of Loquat Branch, showing "Fleck" Cankers.

Fig. 4.—Fruit, showing "Fleck" Spotting. [*After Putterill.*

Suggested Control Measures for "Fleck."

No experiments for the control of entomosporium blight of loquat have been conducted in this State, but it is reasonable to expect that the fungicides which have given good results in the case of a similar disease in pears will satisfactorily control that on the loquat.

The following spray programme is suggested:—

Spray with lime-sulphur—

(*a*) Just before blossoming.
(*b*) Just after the fruit has set.
(*c*) From time to time as the tree makes leaf growth.
(*d*) As far as is practicable, collect and burn diseased leaves, and remove any cankered wood and treat likewise.

Moist, humid conditions may be expected to favour the development of the disease.

Black Spot or Scab.

In August, 1931, a suburban nurseryman forwarded for examination young loquat trees, the stem and leaves of which were badly attacked by the scab fungus, *Fusicladium eriobotryae*, Cav. This fungus is closely allied to those which are responsible for scab in apple and pear. On loquat leaves,

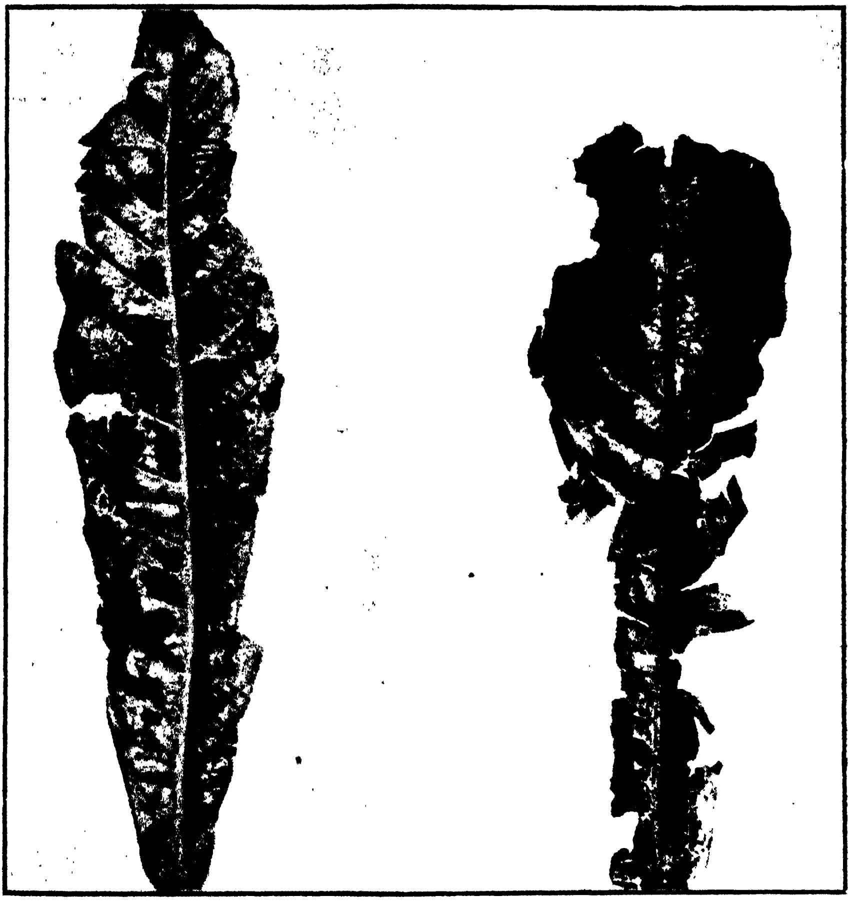


Fig. 5.—Loquat Leaves, showing Black Spot.

more or less circular to irregular, dark-green, velvety spots occur on both the lower and upper surfaces. These spots may spread until almost the entire leaf is involved, presenting a greenish-black appearance on the surface. The affected parts become brittle and break away, causing the leaf to become ragged, as shown in Fig. 5. On the shoots, small, greenish-black, velvety spots occur. These ultimately spread and fuse, forming large elongated blotches (Fig. 6). As the specimens were nursery stock, fruit was not available for examination.

According to Putterill (3) spots similar to those on the leaves are produced on the fruit (Fig. 7). The outer layers of the fruit on diseased parts develop fissures and cracks, due to the death of the tissues and consequent failure of the skin to expand as the fruit swells.

Cobb (2) recorded the disease in this State in 1902, and states: " . . . the disease is very common in some seasons . . . but the disease is among the pests of minor importance. . . . Though most apparent on the fruit, it occurs also on the foliage . . . it may be combated in a manner similar to that employed for the black spot of apple and pear. The foliage of the loquat will stand the application of Bordeaux mixture, and so will the fruit. The value of the crop can alone determine whether it will pay to spray. In most cases the loss from the disease is slight. . . .

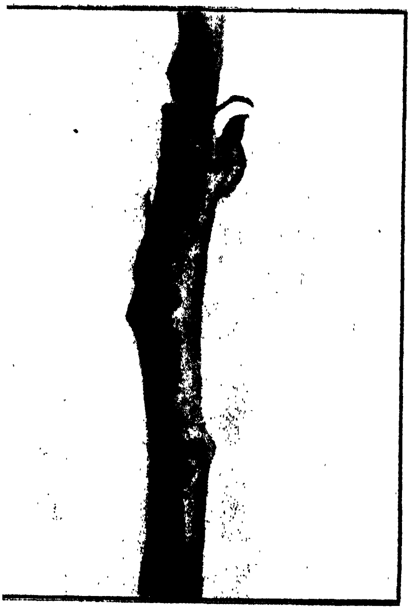


Fig. 6.—Loquat Twig, showing Black Spot Lesions.

Fig. 7.—Loquat Fruit, showing Black Spot. [*After Putterill.*

According to my observations the disease is much more common on neglected trees . . . except in damp situations the disease is rather uncommon on thrifty trees."

Putterill (3) states: "Trees that were examined showed in some instances total destruction of the fruit as well as a very heavy twig infection."

Stevens and Hall (4) state: "In the western parts of California scab is reported as serious upon both fruit and leaves."

Tubeuf and Smith (6) quote Cavera as stating that scab causes leaves to become spotted and wither.

Anderson *et al* (1) record scab in Florida and California.

Stevenson ([5]) records the fungus as causing scabby areas on leaves, stems and fruit in Russia and Italy.

Suggested Control Measures for Black Spot or Scab.

As far as the author is aware, no experiments have been carried out for the control of the disease in New South Wales. Either Bordeaux mixture or lime-sulphur, both of which have given good control of scab of apple—caused by a closely allied fungus—may be expected to give equally good control of the disease on the loquat in this State. Experiments have shown in the case of scab of apple that Bordeaux mixture is liable in certain seasons to cause russeting of the fruit if applied after the "spur-burst" stage. Based on this experience it would be advisable to apply Bordeaux mixture to the loquat only just prior to the opening of the blossom buds and not again until the fruit is half grown, any intermediate applications to be with lime-sulphur, to avoid risk of russeting the fruit, which depreciates its market value.

The following spray programme is suggested:—

1. Spray with Bordeaux mixture, 6-4-40 (home made), just prior to the blossom-buds bursting.
2. Spray with lime-sulphur, 1-35, immediately after the petals have fallen, and periodically as required until the fruit is half grown.
3. Spray with Bordeaux mixture, 6-4-50 (home made), if weather conditions favour the development of the disease after the fruit is half grown.

In the case of nursery stock, periodical applications of Bordeaux mixture, 6-4-50, should be made to keep the disease in check.

As far as is practicable, all diseased fruit and leaves should be collected and burnt, together with any diseased wood which is removed.

Acknowledgment.

Photographs accompanying these notes are by Mr. P. R. Maguire.

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Orchard Notes.

November.

H. BROADFOOT, Special Fruit Instructor.

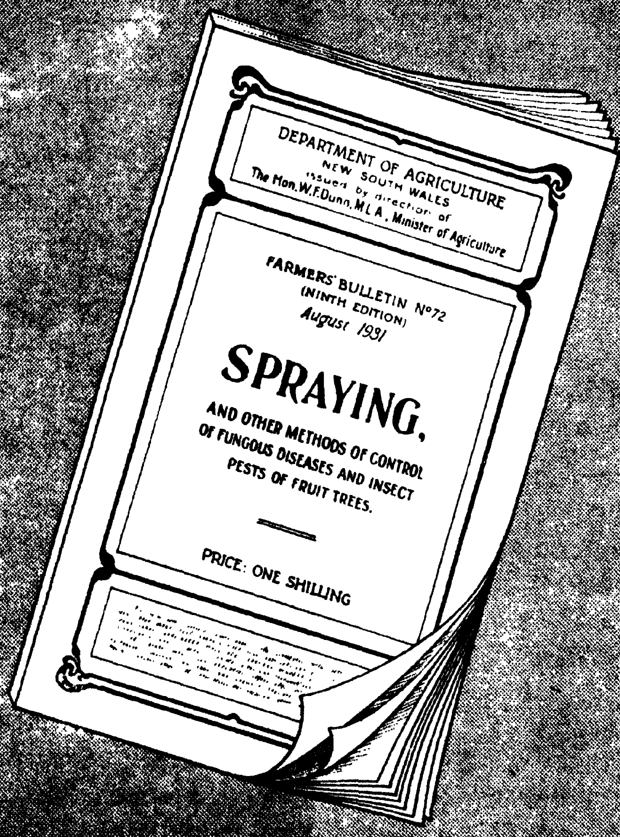
Picking, Packing, and Marketing Cherries.

Cherry picking will be in full swing this month. Many varieties of the cherry are most delicate and very susceptible to injury, and the fruit must therefore be handled carefully; it should be gathered with the stalk intact, separating it carefully from the spurs or branches, as it keeps much better with the full stalk. The fruit should be gathered when dry and cool, and when not more than firm ripe. The bloom should be preserved on varieties which show any. The proper way to handle the fruit is by the stems. Varieties which bruise easily should be picked into shallow baskets holding about 10 lb.; kerosene tins which have been cut in halves for the purpose have also been found suitable. Some prefer the side taken out of the kerosene tin. In either case, the edges should be turned and well beaten down to avoid any injury when emptying the fruit from the tin. It is important that whatever picking utensil is used it should be capable of being slung to the picker's shoulders or hooked on to the limb or ladder convenient to the picker, leaving both his hands free for picking. Many varieties have long, rather slender limbs that will bend down readily. These can be held down under the picker's arm while he picks with both hands.

Where trees are of large size, some form of steps or scaffolding is necessary when picking. Steps should be as light as possible to allow quick shifting, and wide at the base to render them stable. The fruit being small and crowded on good cropping trees, the cherry picker is not moving his position as often as a man picking larger fruits, and a long platform stool is very convenient, allowing the picker to work over quite a wide area of the tree without shifting the position of the stool. A stout plank of light timber between two painter's trestles is convenient when picking heavily laden, extremely large trees, where much of the fruit is out of reach from a convenient sized stool.

Care should be taken to see that the fruit spurs are not broken off at the time of picking; much damage may be done to the trees by careless pickers, resulting in loss in the succeeding crops.

The case which finds most favour with both growers and buyers is the 12-lb. case. At the time of packing, all stemless cherries should be rejected, and the top layer of fruit faced in rows with the stems hidden. This work can be done best by women and girls, who lay the cherries on the bottom of the box in rows, stalks uppermost; then fill the box, taking care that the corners are well filled, nail on the bottom, and either turn over and mark the faced side as top, or stencil the case so that the properly-faced side will be opened, showing the cherries neatly rowed and presenting a


DEPARTMENT OF AGRICULTURE
NEW SOUTH WALES
Issued by direction of
The Hon. W. F. Dunn, M.L.A., Minister of Agriculture
FARMERS' BULLETIN No. 72
(NINTH EDITION)
August 1931
SPRAYING,
AND OTHER METHODS OF CONTROL OF FUNGOUS DISEASES AND INSECT PESTS OF FRUIT TREES.
PRICE: ONE SHILLING

very attractive appearance. When competent packers are not available, or the fruit is rather small or soft for row-facing as described above, an attractive facing can be obtained by picking up the cherries by the stalks and placing them in position in bunches, stalks uppermost, and then filling up as described above.

The boxes should be lined on the sides, top and bottom with clean, white paper, so placed that it can be folded back to expose the cherries when the box is opened.

When the "facing" is done either by rowing or bunching, the greatest care should be taken that the "face" fairly represents the average of what is used to fill in the rest of the box. Some trees yield fruit of smaller average size than others, and by picking these trees separately great assistance is given towards an even pack. But this alone is not sufficient to ensure that the face fairly represents the fruit below. Cherries on the same tree vary much in size, and without any dishonest purpose the packer will unconsciously pick the larger fruit when "rowing in" the face if he does not make a special effort to avoid doing so.

Cherry Tree Slug.

If this pest should appear the trees should be sprayed with lead arsenate before it becomes too numerous. Should it first appear on the trees a few days before the fruit is ready to pick, as it often does, the spraying, of course, must be delayed until after the fruit is harvested.

The Export of Cherries.

The following information in connection with the export of cherries, supplied to a correspondent recently, may be of interest to growers in other districts who may be contemplating export:—

In connection with shipping cherries to the United Kingdom or other distant places, the greatest difficulty will be found in obtaining suitable refrigerated space on a vessel which does the voyage in the least possible time. The best keeping varieties of cherries, generally speaking, will not hold in cold storage for more than eight weeks in a land cool store where conditions for keeping fruit are far more suitable than a ship's refrigerated chamber.

The voyage to the United Kingdom in the fastest ship will occupy a period of approximately six weeks, and added to this period will be the time taken from picking the fruit until it is loaded into the vessel, and the departure of the ship. In addition to this, some time will elapse after the fruit has been discharged at port of destination before it reaches the consumer. It will be seen, therefore, that the margin of time between the life of the fruit and the time it takes to land it in the United Kingdom is very limited, and to obtain the best results it will be essential to observe carefully the following points:—

Picking the fruit at the right degree of maturity.

Careful selection of fruit, all damaged specimens to be discarded.

Fruit to be packed in quarter-cases—packing to be done on the loose side.

Boxes to be nailed carefully to avoid bruising or breaking the skin of the fruit; such injuries are the starting point of common moulds which spread rapidly, especially in fruit loaded in a ship's chamber.

The cherries should be pre-cooled for two days at a temperature of 37 deg. Fahr.

The transference of fruit from land cool store to ship should be done as quickly as possible.

Special refrigerated chambers; battens should be used freely between cases to allow a free circulation of air and a more rapid cooling of the fruit.

The cherries should be carried at a temperature of 30 to 32 deg. Fahr.

Codling Moth and Black Spot.

Details of the methods of controlling codling moth and black spot were given in last month's notes, but growers of pome fruits are reminded that the control measures extend into this month also.

The weather has been favourable for the development of black spot in some of the apple and pear districts and it will therefore be advisable to spray periodically with lime-sulphur (26 deg. Baume) diluted 1 to 35. The lime-sulphur may be added to the cover spray of lead arsenate as detailed last month.

Sour-sap of Fruit Trees.

Mr. W. A. Birmingham, Assistant Biologist, has drawn attention to the fact that sour sap at times causes considerable loss among pome and stone fruit trees.

The cause is not known, but the disease appears to be due to some physiological disturbance with the tree, and possibly has relation to extreme weather conditions, viz., a long spell of dry weather followed by a very wet period, or *vice versa*. So far, all attempts to isolate a causal organism from affected trees have failed. The disease is to be found on all types of soil, and on well-drained as well as on badly-drained land.

The following symptoms may be said to be typical of sour-sap:—

In spring, many buds on one or more branches fail to make any leaf growth; or, if they do, the leaves are scanty and undersized. Owing to lack of foliage, the affected limbs may become sun-scalded, turning reddish-brown and later black in colour. This condition may be confined to one or more branches, or, in some cases may be general throughout the tree. The affected part of the tree is not peculiar to any particular aspect. In some cases, a tuft of leaves is developed only at the extreme tip of affected limbs. On cutting the bark of branches which have recently died, a pronounced sour fermenting smell is noticeable. Diseased trees will often make new, strong, vigorous growth in the centre from the main branches or sucker up from the base.

In stone fruit trees a very characteristic feature of the disease is a slightly elevated ridge running down the main branches. On cutting away the bark from over such a ridge, a well defined line is seen separating the diseased from apparently healthy wood.

Roots of affected trees appear quite normal to the unaided eye, but when cut, may show, on careful examination, the presence of a brownish discoloration in parts, due to the presence of gum in the tissues.

Trees which appear to be badly affected in the early part of the season may make complete recovery if subsequent weather conditions are normal, while on the other hand individual trees or batches of trees may gradually or suddenly die out.

Definite control measures cannot be recommended, but the following may be expected to minimise losses caused by this disease.

1. Scarfing or lightly cutting the bark of affected trees by means of a sharp knife. The cut should be lightly made, so as not to extend into the wood, and should be a continuous one from the ground line up the trunk and main limbs, one cut to correspond with each branch.

2. Any limbs which fail to make growth by the end of the growing season should be examined by removing small portions of bark with a sharp knife, and if the underlying wood is brownish in colour, or the thin layer of tissue between the wood and bark is brown or black in colour, the limb or limbs should be removed, cutting well back to healthy wood. This is advisable only where sufficient of the tree can be left to make a fairly well-balanced top.

The Possibilities of Australian Nut Culture.

Mr. H. W. Eastwood, Fruit Instructor, Murwillumbah, in drawing attention to the possibilities of the commercial culture of the Australian Nut (*Macadamia ternifolia*), points out that commercial fruit-growing on the North Coast has to date mainly concerned comparatively short-lived fruits such as bananas, pineapples, papaws, passion-fruit, etc., and that the continuous replanting has not given the industry the stability generally associated with other kinds of fruit-growing. Growers who are keen on establishing a permanent orchard have an opportunity of doing so by planting the Australian Nut tree which is reputed to live up to 100 years.

Although the growing of this nut tree for profit is only a new development, the industry is showing signs of quick advancement. An indication of this is found in the fact that an Australian Nut Association has been formed to encourage and foster the growing of our native nut tree on an extensive scale. Besides the advantage of longevity, the tree is indigenous to the North Coast and will flourish in its native habitat under varying conditions of soil and local environment.

The limited scope of distribution and marketing, and the problems associated therewith, common to the quicker-producing exotic fruits, are hardly factors to be reckoned with in the Australian Nut. There should be no difficulty in satisfactorily supplying not only the local and Australian

markets, but the most distant overseas markets also. The purposes this nut can be used for in secondary products further enhance its marketing scope.

The interplanting of this nut tree in banana plantations is an easy and economical way of starting a nut grove and establishing it under suitable conditions. As there is a definite period for the commercial life of bananas, on the less rich soils, at least, it appears a good idea to interplant the bananas with nut trees. The bananas provide the necessary shelter to the trees and the cultivation and attention bestowed on the palms are also essential for the nut trees, especially in their early stages of growth. They are thus established during the profitable life of the banana plantation with very little additional expense to that necessary in the banana plantation. When the bananas become unprofitable a permanent nut grove about to come into bearing replaces the defunct plantation.

Authentic information as to the returns from the commercial culture of this nut is not available, but any tendency to exaggerate the profits which can be expected in the future may result in disappointment later on.

Write to the Department for a List of Publications.

"Thanks very much for the leaflets and bulletins forwarded to me," writes a Tomerong farmer in expressing appreciation for the departmental pamphlets sent to him in response to his inquiry for information on certain farming problems. "The publications," he continues, "have been of great assistance to me, and by following the advice in them I feel that I have gained in a very short time the knowledge that has taken others years of hard work and experience to accumulate."

The Department has between five and six hundred leaflets, designed to supply practical and up-to-date advice on most farming subjects. Write for a list of publications. The Department's address is Box 36A, G.P.O., Sydney.

Payment of Wheat Bounty.

The following are particulars of wheat bounty claims received and dealt with by the Federal Department of Commerce up to 4th August:—

	Claims received.	Claims passed for payment.	Amount paid.
			£
New South Wales ...	36,848	35,798	929,874
Victoria	35,017	33,336	794,512
South Australia	43,555	42,135	845,666
Western Australia ...	22,244	21,476	699,011
Queensland	3,060	3,060	64,308
Tasmania	431	388	1,864
	141,155	136,193	3,335,235

Poultry Notes.

NOVEMBER.

E. HADLINGTON, Poultry Expert.

The Danger of the Unskilled Breeder.

IN recent years the poultry industry has made rapid growth, and with this development has come many changes, some for the better and some for the worse. It is the latter which chiefly concern poultry farmers, and there are several which have an important bearing on the future of the industry in this country, and cannot be ignored if we would maintain the standard of physique, quality, and productivity which has been built up by the pioneers of commercial poultry farming.

One of the most noticeable features of the industry to-day is the number of people engaged in commercial poultry farming who have little knowledge of the principles of breeding or of the type and character of the breeds they are keeping; but this is only to be expected when one considers how quickly they have become established in the industry. Moreover, many have not attempted to study the subject of breeding, but have relied upon day-old chicks to maintain their flocks. Thus, with them, poultry-farming is not a matter of breeding to establish a flock of a high standard, but is mainly a question of attaining numbers of layers, and, provided that the chickens are secured from reputable breeders, there is little objection to this course, as long as it goes no further. The trouble, however, is that many of these inexperienced poultry farmers are lured into what appears a lucrative business—the selling of chickens or the supplying of eggs to hatcheries catering for the day-old chick trade—and under such circumstances a desirable standard of physique and quality cannot be expected. Further, to secure orders prices are cut to such a level that the careful breeder cannot compete and maintain quality.

The result should be obvious, and is, in fact, becoming more manifest each year in the high rate of mortality among chickens, and in the lack of character and stamina in many flocks. The position may be summed up in the words of a large hatcheryman, who, when asked by a visitor what became of all the thousands of chickens sold, replied that half of them died. He meant, of course, that many purchasers, through inexperience or unsuitable equipment, killed half of the chickens, but, nevertheless, strong chickens will survive where those bred from inferior stock will perish.

A factor contributing to the heavy mortality among chickens is the tendency on the part of numerous beginners to purchase far more than can be properly handled at one time. The chickens become crowded as they grow in the brooders, and also in the other stages of rearing, and the result is heavy losses and lack of development.

All this is tending towards deterioration in our flocks, and in this connection we are following some of the older countries, where mass production and extreme artificial methods are adopted to a large extent on commercial farms. During my tour abroad I was informed by a leading veterinary officer in a very large poultry-farming centre that it was common for the losses among chickens to reach as high as 50 per cent., and the mortality among laying hens was frequently from 20 to 30 per cent. per annum. Yet the methods adopted in such countries are often held up as examples to follow.

Surely, then, it is time we paused to consider where indiscriminate methods of breeding are leading the industry, and that each poultry farmer endeavoured to produce better quality stock. When it is realised that it is only by constant, careful selection that the most successful stud breeders are able to keep up the standard of their birds, it should be apparent that breeding from all and sundry birds must lead to degeneracy.

Utility Stud Farms Required.

What is required at the present time is a larger number of small utility stud farms where skill and knowledge of breeding are devoted to producing birds combining egg production, breed character, and that robust physique necessary to improve flocks. On such farms no " factory " methods should be employed, but the reverse, as it is essential that the birds be grown on free range. There should be a golden opportunity for men of experience to work up farms such as outlined, as there is a growing demand for stock which can be depended upon to improve quality.

Whereas in the past many birds were purchased from fanciers or standard breeders by commercial farmers, this is not now the case, as the egg farmer looks for records behind the birds he buys, so that to-day there are too few sources from which birds combining quality with high productivity can be secured.

Perhaps what is equally urgent is that reputable hatcherymen should organise to endeavour to prevent the suicidal price-cutting now indulged in, which can only result in the selling of inferior chickens, to the detriment of the farmer who buys them.

Another evil which has increased during the past couple of years is the selling of chickens hatched late in October and November. Such chickens, unless reared under specially good conditions, do not thrive well, and where large numbers are kept the losses are heavy. Not only so, but when the birds are about half-grown they remain at a standstill until the cooler weather of the autumn commences. This is due to the fact that they meet with the hottest part of the summer and their growth is arrested. Such birds are also more susceptible to diseases such as chicken-pox and roup. The sale of these late chickens is, therefore, unsatisfactory to the purchaser, and reflects on the day-old chick trade generally.

Cod Liver Oil Feeding Tests.

Last year a test was carried out at the Government Poultry Farm, Seven Hills, to compare the results from feeding cod liver oil in the ration for chickens, as against the ordinary chicken ration in use at that farm. The cod liver oil used was a Scottish product of guaranteed quality, said to have shown by recent test, a vitamin A content of 11 Lovibond blue colour units, which is somewhat higher than the recognised standard for cod liver oil for stock feeding.

In the test carried out, 200 heavy-breed chickens hatched on 1st September were used, half being fed with the oil in the ration and the other half receiving the ordinary ration. The conditions for both lots were identical, the only difference being that 1 per cent. of cod liver oil was added to the mash fed to one group.

The test was carried out over a period of twelve weeks, and the results were as follows:—

WEIGHT of Chickens (Heavy Breeds), Cod Liver Oil Feeding Test, 1931.

Age when Weighed.	Group 1 (1 per cent. Cod Liver Oil in Ration.)				Group 2. (Ordinary Ration.)			
	No. of Chickens.	Total Weight.	Average Weight per Chicken.		No. of Chickens.	Total Weight.	Average. Weight per Chicken.	
		lb.	lb.	oz.		lb.	lb.	oz.
4 weeks	Pen 1—50......	15	0	4·8	Pen 3—50......	16½	0	5·44
	Pen 2—50......	15	0	4·8	Pen 4—50......	16	0	5·28
6 ,, ...	Pen 1—50......	25	0	8	Pen 3—50......	29	0	9.28
	Pen 2—50......	26	0	8·32	Pen 4—50......	29	0	9·28
8 ,, ...	Pen 1—50......	47	0	15·04	Pen 3—50......	53	1	0·96
	Pen 2—50......	48	0	15·36	Pen 4—50......	49	0	15·68
10 ,, ...	Pen 1—50......	66	1	5·18	Pen 3—48......	74	1	8·67
	Pen 2—50......	64	1	4·8	Pen 4—50......	76	1	8·32
12 ,, ...	Pen 1—50......	93	1	13·76	Pen 3—48......	105	2	3
	Pen 2—50......	92	1	13·44	Pen 4—50......	104	2	1·28

It was noted that the chickens in the group receiving the oil did not appear to thrive as well during the first six weeks as the lot in the check pens. It will be seen that the weights of the check groups were higher at each of the various weighings.

In order to obtain further information on the subject, another test was carried out this season with 200 chickens, half of which were Leghorns and half heavy breeds, equal numbers of each breed being included in each group. The test was carried out under the same conditions as last year, except that the oil was from a different source, and was of medicinal quality conforming to the British pharmaceutical standard. The chickens were hatched on 6th July, 1932. The results were similar to those of the previous year, as will be seen from the following particulars:—

WEIGHT of Chickens, Cod Liver Oil Feeding Test, 1932.

Age when Weighed.	Group 1. (1 per cent. Cod Liver Oil in Ration.)			Group 2. (Ordinary Ration.)		
	No. of Chickens.	Total Weight.	Average Weight per Chicken.	No. of Chickens.	Total Weight.	Average Weight per Chicken.
			Heavy Breeds.			
		lb.	lb. oz.		lb.	lb. oz.
4 weeks ...	50	15	0 4·8	50	16	0 5·12
6 ,, ...	50	28	0 8·96	50	29	0 9·28
8 ,, ...	50	45	0 14·4	50	46	0 14·7
10 ,, ...	50	73	1 7·3	50	72	1 7
12 ,, ...	50	93	1 13·7	50	91	1 13·1
			Light Breeds.			
4 ,, ...	49	15	0 4·9	49	15	0 4·9
6 ,, ...	48	26	0 8·66	44	26	0 9·45
8 ,, ...	48	43	0 14·3	44	41	0 14·9
10 ,, ...	48	67	1 6·3	44	61	1 6·2
12 ,, ...	48	86	1 12·6	44	79	1 12·7

The chickens in each case were reared in the hot-water circulating system brooders, and had access to sunlight, while they were also given liberal supplies of green stuff.

The results should be of interest to many poultry-farmers, and while they should not be regarded as definitely conclusive, it would appear that 1 per cent. of oil has no beneficial effect upon chickens having access to sunlight. In the case of chickens confined away from sunlight, however, it is generally accepted that cod liver oil is essential, and is beneficial in cases where no green feed is available over long periods.

The Ration Used.

The composition of the ration fed to both lots of chickens and used as a standard ration, is as under:—

Wet Mash—

Pollard	... ...	64 lb.
Bran	... ...	33 ,,
Bonemeal	... ...	3 ,,
		100
Salt	... ...	22 ozs.

Evening Meal—

Kibbled wheat ...	...	55 lb.
Kibbled maize ...	...	30 ,,
Kibbled skinless oats ...		10 ,,
Hemp seed	... ...	5 ,,
		100 ,,

The mash is mixed with skim milk powder dissolved in water at the rate of 1 lb. to a gallon, and the salt is dissolved in this liquid, using 1 ounce to each 5 lb. of dry ingredients to be mixed. The mash is made to a crumbly consistency and fed in troughs four times per day during the first six weeks, and three times from then on to twelve weeks of age.

One feed of the chicken mixture is given for the last meal of the day during the first period, and from then onwards whole wheat and cracked maize is used in place of the chick mixture. Finely chaffed green feed, chiefly lucerne and Berseem clover, is supplied daily after the first week. Shell grit is always available to the chickens.

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Agricultural Gazette of New South Wales.

The Organisation of Bush Fire Brigades.

LEONARD JUDD, H.D.A., Manager, Temora Experiment Farm.

THE disastrous losses of both stock and property suffered in the summer of 1931-1932 through bush fires are still fresh in the minds of the majority of primary producers. The suggestion is made that they should profit by past experience and give consideration to timely action in the direction of forming efficient fire-fighting units right throughout the rural districts. This is a movement that could well be taken up by branches of such organisations as the Agricultural Bureau or the Farmers and Settlers' Association, which should experience no difficulty in securing both executive and personnel.

While admitting portion of the loss and damage suffered in the past was inevitable, none the less it must be conceded that efficient fire-fighting units could have minimised the damage which occurred. Appreciation of this fact has prompted the publication of the methods of working and the organisation adopted by some bush fire brigades.

In fighting bush fires systematic and capable organisation may be said to be the factor essential to success. Prompt action coupled with capable guidance may avert many a catastrophe.

The Personnel of a Brigade.

In the organisation of a brigade the following are generally recognised as the necessary personnel:—Captain; four or more vice-captains; secretary; treasurer; members.

The captain should, first and foremost, be a capable organiser and a leader of men. He should also be well versed in bush craft and possess the qualities essential to the position, such as enthusiasm, calmness, ability to think quickly and to take deliberate action, and at the same time a personality which will inspire these qualities in others.

In the selection of vice-captains, consideration should be given to location in addition to qualifications. They should be selected from points north, south, east and west from the central town or village. By this arrangement capable leadership is ensured at the various centres of the district in the event of an outbreak of fire. The fallacy of appointing all the executive officers from one particular section or direction in the district can be readily seen. All executive officers should, if possible, be connected by telephone.

The Secretary and his Duties.

A live secretary is essential, as numerous duties are required of him, and he has to take a considerable amount of responsibility. The careful and thoughtful notification of members in the event of fire will devolve on him. During an outbreak the captain or vice-captain in charge of

arrangements will keep in constant touch with the secretary (who should never move from headquarters), advising him of the progress of operations and the necessity for reinforcements and equipment. Telephone communication is not always possible, and in such cases gallopers should be resorted to.

In the event of a fire anywhere in the district, all executive officers should immediately get in touch with the secretary and those in the section not affected should "stand by" and in common with all other members be prepared to proceed immediately to the seat of trouble should their services be required.

The secretary, having full particulars of the location of the fire and the direction of travel, will take steps to notify all stockowners possible to enable stock to be taken to safe quarters, such as fallow paddocks. Calmness on the part of the secretary is essential; pannicky advice and instructions to members may result in the unnecessary rush of men and equipment to a situation, and excessive and needless travelling on the part of members. For instance, an outbreak in the north may be quelled by that particular section alone, or by reinforcements for either or both the east and west. The southern men should only be called in event of the situation proving beyond the assistance available.

Supplies of drinking water and refreshments are matters of vital importance and should receive the attention of the secretary. He should accumulate all information on the latest equipment and most up-to-date appliances available on the market for fire-fighting, with the view of having the equipment as efficient as possible. Steps should be taken by him to notify the local council of the appointed leaders of the movement yearly, so that application can be made and approval secured for the cutting of fences where necessary and the lighting of fire breaks where deemed advisable.

The secretary, acting upon instructions from the executive, should call a meeting at the end of the winter for the purpose of discussing the advisability of, and location of, fire-breaks in sections of the district, and yearly take steps to organise a "fire-break campaign" to encourage individual landholders to plough effective fire-breaks on each individual holding. A little organising in this direction would eventually bear fruit and landholders would acquire the habit of making these safeguards yearly. Many a serious fire has been nipped in the bud in the early stages due to a modest fire-break in the paddock where the fire started.

A further meeting should be held in the early part of the summer in day time, when all equipment would be assembled for inspection and any necessary renovation work carried out. The equipment is thereby checked, and the executive has the knowledge that in the event of trouble everything is in order. At this meeting a copy of an inventory of equipment under the charge of each vice-captain should be handed to the captain; also full particulars as to water supplies available in his sector, and centres where telephone communication can be established. Each vice-captain, having an inventory of equipment, can see that the equipment is checked after use.

The Equipment Necessary.

Tanks, 100-gallon.—These should be built into wooden frames for protection and fitted with a pump and approximately 30 feet of ¾-inch hose. They should be located with members who have motor lorries and should at all times be kept in readiness on a stage to permit of sliding on to the lorry with minimum of delay and trouble. As many of these tanks as possible should be available, as they form the most valuable aid in fire-fighting.

Water Carts.—These horse-drawn vehicles are exceptionally handy where the travelling distance is not great. They form the mainstay of the "mopping-up party," whose duty it is to see that all old logs and stumps, etc., adjoining unburnt crops or grass land are thoroughly extinguished. Unless effectively cleaned up these logs, etc., are a constant source of danger and liable to start another conflagration, particularly in the event of a change in the direction of the wind.

These carts are used in combination with buckets and hand sprays.

Oil Drums.—Old 40-gallon oil drums are exceedingly handy for the transport of water, being easily loaded on to lorries, etc., and any available should always be kept full in readiness. If fitted with a small semi-rotary pump and hose, they are also effective fire-fighting appliances.

Knap-sack Pump and Spray.—These are remarkably handy and as many as possible should be available for members.

Buckets and Hand Spray Pumps.—These are used in combination with the water cart chiefly; their use effects a wonderful economy in the amount of water, which is an important factor in fire-fighting.

Leather Beaters.—These are far more efficient and not nearly as exhausting to use as the "green bush" or "wet bag." They are easily constructed from hide leather, saplings or old tool handles being used for handles.

Horse, Leading Harness and Long Drag Chain.—Horses harnessed with leading harness with a long drag chain attached are remarkably handy for dragging burning logs, etc., back to burnt sections and away from unburnt grass or crop.

Fire Lighter.—These should be in possession of the captain for the purpose of burning fire-breaks if it is deemed necessary.

Portable Field Telephone.—The possession of one of these materially assists in conveying information with a minimum of delay to quarters desired. Its timely use may permit of reinforcements being urgently recruited for a strategic point, or obviate needless travelling.

Axes and wire-cutters should be carried by the captain and vice-captain, and numerous members.

Financing a Brigade.

Naturally a brigade requires finance for the conduct of operations. Administrative expenses must be met, and benzine and oil allowed to members whose lorries are used. Equipment has to be purchased and a certain amount must be expended from time to time in its maintenance. Refreshments also have sometimes to be bought.

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To provide finance the usual procedure is to strike a levy according to the areas held by respective members. The following schemes give a rough idea of the procedure usually adopted. Naturally these can be modified or altered to suit the wishes of members:—

	Area.	*Levy.* s.	d.
(1)	100 to 500 acres	2	6
	500 to 1,000 acres	5	0
	1,000 acres	10	0
	Each succeeding 1,000 acres or part thereof ...	5	0
	Sharefarmers (nominal charge)	2	6

(2) Flat rate of 5s. per landholder irrespective of area. Sharefarmers, 2s. 6d.

Loyalty is Essential to Success.

A fire brigade can only attain the peak of efficiency and usefulness when it possesses not only the loyalty of every member of the unit, but in turn the whole-hearted support of every section of the local community. All residents must appreciate that the provision of adequate protection of the district is a community responsibility and interest. Loss is never individual; a loss to a particular person is felt in any case throughout the community. Commercial interests in a district can effectively assist the movement by not only direct subscription, but by the supply of necessary equipment at landed prices.

A Suggested Constitution for a Brigade.

The following constitution is suggested for use in the formation of a bush fire brigade:—

Name.—The name of the brigade shall be "The....................Bush Fire Brigade."

The Objects of the Brigade Shall Be—To organise and maintain an efficient bush fire fighting unit such as will be ready and equipped to—

(*a*) Organise preventive measures;
(*b*) Check bush fires;
(*c*) Minimise losses to stock and property.

Membership.—Landholders, tenants and others interested will be expected to become active members.

Subscription.—Membership fees for the year shall be decided at each annual meeting and shall be on a property basis. The fees for the year.........shall be 6d. per 100 acres, with a maximum subscription of 30s.; sharefarmers, 2s. 6d.; non-landholders, 1s.

Officers.—The control of the brigade shall be vested in a board of eight directors who shall be elected annually. For the purposes of election the proposed area shall be divided into eight wards, each of which will elect one director. Voting shall be on the basis of one member one vote. Voting shall be by ballot—if desired by any member—or by show of hands. Should a director absent himself without sufficient excuse from two consecutive meetings his seat may be declared vacant by the board of directors, and a substitute appointed by the board to hold office for the completion of the year. Vacancies on the board for any other reason shall be filled in a similar manner.

At the first meeting after the annual election, the board shall elect a captain, four vice-captains, an honorary secretary and an honorary treasurer. The board shall also appoint from the members of the brigade, lieutenants, scouts and such other officers as may be deemed necessary.

Duties of Officers—

(*a*) The treasurer shall receive all moneys belonging to the brigade and deposit same forthwith to the credit of the brigade's account in the bank. He shall keep proper accounts of all receipts and expenditure, and shall prepare a statement thereof to be presented at the annual general meeting.

(*b*) The secretary shall take minutes of all meetings, conduct all correspondence, send out notices for all meetings and do all the clerical work in connection with the brigade.

(*c*) The captain shall have full control of all operations at fires, shall decide in what place each member shall work and the positions and movements of each tank.

(*d*) Lieutenants shall be stationed at such positions and take charge of such operations as the captain shall direct, and in the absence of the captain the lieutenant who is first on the scene of the outbreak shall take charge until the arrival of the captain.

(*e*) A scout shall upon discovering an outbreak in his portion of the district take or send word immediately to the captain and shall report the position of the fire at various places on the road. After reporting the fire he shall hold himself in readiness to remove any stock that may be in danger. Each scout shall be provided with a wire-cutter and shall where possible provide himself with a stockwhip.

Meetings.—The annual general meeting shall be held in the late winter of each year. At this meeting the board of directors for the year will be elected, and the general equipment and plans for the year discussed.

The directors shall meet as early as possible after this date to make arrangements for the purchase of necessary equipment and for the organisation of such firebreaks and other preventive measures as may have been decided upon at the annual meeting.

A general meeting will be held in the late spring of each year at which the equipment of the brigade will be inspected and arrangements made for its distribution at strategic points. Other general meetings will be held as called by the secretary when instructed by the captain or when requested in writing by not less than six members of the brigade.

At all general meetings a quorum shall consist of.........members.

At all meetings of the board of directors, four shall constitute a quorum.

Funds of the Brigade.—The funds of the brigade shall be placed in a bank, to be selected by the committee, and such funds shall only be drawn by cheque signed by two members whom the committee may appoint.

Property of the Brigade.—The whole of the working plant or other property shall be under the sole control of the committee, who shall decide as to where all water tanks and other appliances shall be stationed or distributed.

Work at Fires.—At all fires the captain or officer in charge of operations shall as far as possible consult the owner or occupiers of the land on which the fire is burning.

Auditor.—The committee shall at its last meeting each year appoint one auditor who shall examine all books and accounts and sign balance-sheet as being correct.

Financial Year.—The financial year of the brigade shall terminate on the.............. day..................in each year.

Use of Tanks and Appliances.—Any member of the brigade may obtain the use of the tanks and other appliances for the purpose of burning breaks or stubble; application for same to be made to the captain. The committee, however, may pass a resolution forbidding the use of the tanks and appliances for these purposes at any time during the months of December, January and February. Should a fire start in the vicinity, the member having the use of the tanks shall at once take them to the scene of the outbreak, and shall be held responsible for their prompt delivery. Members using the tanks or appliances must return same in good order and condition within 48 hours.

Alteration of Rules.—No rule of the brigade shall be altered or repealed, nor shall any new rule be adopted except at an annual general meeting, or at a special general meeting called for the purpose, of which due notice shall have been given.

Varieties of Wheat, Oats and Barley.

Departmental Recommendations for Different Districts.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THE following are the latest recommendations as to the varieties of wheat, oats and barley best suited to various portions of the State. Growers are advised to make early arrangements for supply of seed, and if in doubt as to which variety to sow they should communicate with the Department of Agriculture.

WHEAT.

Coastal Districts.

(Embracing districts which are specially subject to rust.)

For Hay—

Gresley, Florence, Firbank, Clarendon (early maturing varieties).

For Green Fodder—

Gresley, Florence, Firbank, Clarendon (early maturing varieties).
Sowing for hay should be made later than for green fodder.

Northern Tableland.

(Of which Glen Innes is representative.)

For Grain or Hay—

Cleveland (early sowing);
Ford (mid-season sowing);
Nabawa (mid-season sowing);
Clarendon (mid-season and late sowing).

For Green Fodder—

Cleveland (early sowing);
Ford (early sowing);
Clarendon (early, mid-season and late sowing).

Central Tableland.

(Of which Bathurst is representative.)

For Grain or Hay—

Canimbla (early and mid-season sowing);
Cleveland (early and mid-season sowing);
Cadia (early and mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

Southern Tableland.

(Of which the Monaro, Crookwell and Batlow are representative.)

For Grain or Hay—

Cleveland (early sowing);
Yandilla King (early sowing);
Waratah (mid-season and late sowing).

South-western Slopes and Eastern Riverina.

(Of which Wagga, Temora, Wyalong and Barellan are representative.)

For Grain or Hay—

Yandilla King (early sowing);
Turvey (early sowing);
Penny (early sowing);
Marshall's No. 3 (early sowing, for more favoured districts, such as Henty, Junee and Young);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Baroota Wonder (mid-season and late sowing).

For Grain only—

Union (early and mid-season sowing);
Federation (early and mid-season sowing);
Bobin (mid-season and late sowing).

For Grain on Mallee Soils—

Currawa (early sowing);
Penny (early sowing);
Nabawa (mid-season sowing).

For Hay only—

Zealand (early sowing);
Gresley (mid-season sowing).

South-western Plains and Western Riverina.

(Of which Deniliquin, Cargelligo and Hillston are representative.)

For Grain or Hay—

Nabawa (mid-season sowing);
Waratah (mid-season sowing);
Gresley (mid-season sowing).

For Grain only—

Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Bobin (mid-season sowing);
Canberra (mid-season and late sowing).

For Grain on Mallee Soils—

Currawa (early sowing);
Penny (early sowing);
Nabawa (mid-season sowing).

Central-western Slopes.

(Of which Dubbo, Narromine, Gilgandra, Wellington, Cowra, Grenfell, Forbes and Parkes are representative.)

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Coonabarabran);
Canimbla (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Turvey (early and mid-season sowing);
Marshall's No. 3 (early and mid-season sowing);
Penny (early and mid-season sowing);
Ford (early and mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Riverina (late sowing).

For Grain only—

Wandilla (early and mid-season sowing);
Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Bobin (mid-season sowing);
Duri (mid-season and late sowing).

North-western Slopes.

(Of which Tamworth and Gunnedah are representative.)

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Inverell and Delungra;
Currawa (early sowing);
Canimbla (early sowing);
Ford (early sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Clarendon (late sowing).

For Grain only—

Aussie (mid-season and late sowing);
Duri (mid-season and late sowing).

North-western Plain.

(Of which Coonamble is representative.)

For Grain or Hay—

Nabawa (early and mid-season sowing);
Waratah (mid-season and late sowing);
Duri (mid-season and late sowing);
Florence (mid-season and late sowing);
Clarendon (early, mid-season and late sowing).

Western Plains.

(Of which Nyngan, Trangie and Condobolin are representative.)

For Grain or Hay—

Nabawa (early sowing);
Bobin (early and mid-season sowing);
Baroota Wonder (mid-season sowing);
Waratah (mid-season sowing);
Riverina (mid-season and late sowing).

For Hay only—

Firbank (early and mid-season sowing).

Murrumbidgee Irrigation Area.

For Grain or Hay on the Irrigated Areas—

Marshall's No. 3 (early sowing);
Yandilla King (early sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

For Grain only on the Irrigated Areas—

Wandilla (early sowing);
Federation (early and mid-season sowing);
Union (early and mid-season sowing).

For Hay only on the Irrigated Areas—

Zealand (early sowing);
Gresley (mid-season and late sowing).

OATS.

Varieties Recommended.

The varieties recommended by the Department for the various portions of the State are as follows:—

North Coast.—Algerian (for grazing), Sunrise, Mulga, Buddah.
South Coast.—Algerian, Sunrise, Mulga, Buddah.
Central Tableland.—Algerian, Guyra, Belar.
Northern Tableland.—White Tartarian, Algerian, Guyra.
Southern Tableland.—Algerian, Guyra, Sunrise, Mulga, Buddah.
Monaro.—White Tartarian, Algerian, Mulga.
South-western Slopes and Riverina.—Algerian, Guyra, Belar, Mulga, Gidgee, Palestine.
Central-western Slopes—Algerian, Guyra, Belar, Mulga, Buddah, Gidgee, Palestine.
North-western Slopes.—Algerian, Guyra, Belar, Sunrise, Mulga, Buddah.
Under Irrigation.—Algerian, Guyra, Sunrise, Mulga.
Western Plains.—Sunrise, Gidgee, Mulga, Buddah, Palestine.

BARLEY.

The varieties recommended by the Department are:—

Two-row type (commonly called "malting barleys").—Pryor.

Six-row type (commonly called "feed barleys").—Skinless for early winter green feed. Cape and Trabut for green fodder and grain.

PURE SEED SUPPLY.

In each issue of this *Gazette* is published a list showing where pure seed of the various varieties recommended to farmers may be obtained. These supplies come either from the Department's experiment farms or from reliable farmers in different districts, who are concentrating on the selection and improvement of varieties, which are kept pure and maintained or improved in yielding capacity.

THE OCCURRENCE OF BLACKLEG OF POTATOES IN NEW SOUTH WALES.

BLACKLEG is a popular name given to a bacterial disease of the potato. The disease has occasioned heavy losses this spring in many potato crops planted in the coastal areas of this State; instances of 50 per cent. infection in certain small areas have been observed. Until this year doubt has existed as to whether blackleg occurred in New South Wales, but a recent investigation by the writer has established this fact beyond doubt. During 1931, Dr. W. L. Waterhouse of Sydney University isolated an organism from a suspected "blackleg" plant. Although this organism does not correspond in cultural characters with the present isolations, it is possible that it comes within the group recorded in other parts of the world as blackleg pathogens.

The first signs of the disease are yellowing of the lower leaves and upward curling of the upper leaves. Infected plants are usually dwarfed and may be easily uprooted. The bases of the stems of such plants are decayed, black in colour, and, in wet soils, may show a coating of bacterial slime. The set is usually rotted to a foul-smelling mass. On splitting open the stem, the internal discoloured area will be seen to extend upwards a considerable distance beyond the external injury. Later, infected plants wilt and shrivel and the blackened area moves further up the stem.

Diseased plants usually appear at random over the field, but may occur in groups in wet patches of soil.

The disease may originate from the planting of infected sets, or infection may come directly from the soil. The bacteria which causes blackleg are present in most cultivated soils and may infect sets when conditions are favourable. Such conditions obtain when the soil becomes very wet, which results in interference with the normal healing of the cut or injured surfaces of the sets. The heavy spring rains recently experienced in the coastal areas of this State would provide excellent conditions for this type of infection.—C. J. MAGEE, Assistant Biologist.

Millet.

A Useful Catch Crop.

L. S. HARRISON, Special Agricultural Instructor.

Reference is made to millet in this issue of the *Gazette* because it is a crop that does not receive as much recognition as its general usefulness merits. It is considered advisable to point out the more important features here so that a realisation of its value may be gained by those who would be able to include it amongst their fodder crops.

MILLET, a quick growing and widely useful catch crop, is of particular interest in the spring and summer months, and is recognised as the most valuable of those suited to that period of the year because of its early maturity, suitability from a feeding viewpoint, and ability to produce a good bulk on land from which another crop has recently been taken, or on which a crop has failed, providing growing conditions are reasonable. The crop may be handled cheaply, as little attention is required after the crop is planted.

A crop of millet may be fed off in its green condition and then allowed to mature a growth for hay. When it is so treated it is advisable to harrow the stubble to loosen the soil, and by this method a satisfactory second growth is usually obtained.

Varieties.

The various millets may be recognised partly by the distinctive colour acquired by the ripened seed, and are grouped as white, yellow, or red. They vary considerably, even under those heads, and possess peculiarities in their growth and colour of foliage. The most useful varieties are Japanese, Hungarian, Manchurian (white and yellow), White French, and Pearl. Of these Japanese is by far the most widely grown; it is perhaps the quickest growing of all plants cultivated on the farm, providing it finds suitable weather conditions, and may be grown for hay, green fodder, or to be fed off by stock.

Japanese also is about the best stooler of all the millets, and the best variety for feeding off. Hungarian is useful as a hay variety, but is not a good stooler, and will not stand a dry weather pinch like Japanese. Where grain is required the Manchurian varieties will be found the most prolific. The yellow variety is the best for seed: the ripened grain may be fed to poultry and pigeons with advantage in conjunction with other grains.

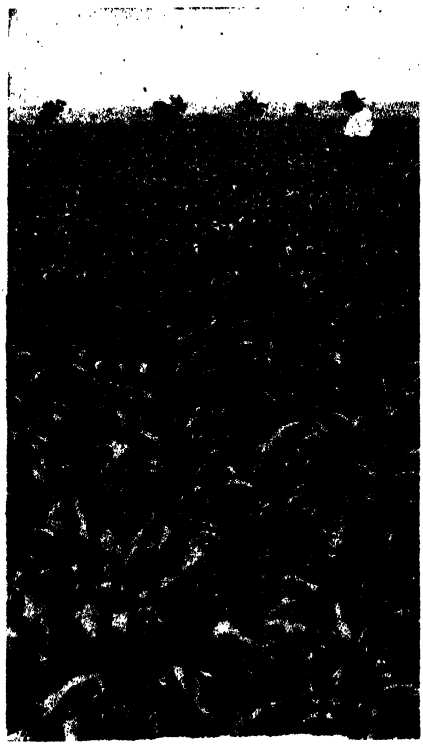
Soil.

The millets are very hardy. They require a medium quantity of moisture, grow luxuriantly on a variety of soils, and endure drought remarkably

well. They do best in a mellow soil, rich in humus. It has to be remembered that this plant secures its nourishment chiefly from the surface soil, and it is advisable to make an application of superphosphate at the rate of 1 cwt. per acre. The fertiliser is best harrowed in before sowing the seed.

Sowing.

The quantity of seed required is liable to variation, for when the land is fertile and in good condition less seed is necessary than for poor soils; if sown too thinly, however, the resultant growth will be coarse and unfit for making into hay. Thus the amount of seed required varies from 8 lb. to 12 lb. per acre.



Crop of White French Millet.

In sowing, it has always to be remembered that millets are very susceptible to low temperatures and frosts. Where there is an absence of fodder—such as in periods of drought—it is best to sow continuously every two or three weeks as long as there is warmth and moisture sufficient to germinate and raise the crop, while avoiding the danger of early frosts.

Occasionally other spring-sown crops fail owing to dry weather conditions, and then a crop of millet would be found suitable, as it may be taken off early enough to admit of the ground being prepared for autumn-sown crops. Under such conditions, there being little or no plant growth on the ground, the millet seed may be broadcasted and disced or springtooth cultivated in.

Millet can be used for forage, hay, or silage with equally good results. It may be sown to the end of January, and even later. Some advocate drilling the seed as against the usual method used of broadcasting. It is claimed that less seed need be used, and, further, that if the soil cakes, it can be cultivated between the rows. If for grain production or silage then drilling would be advantageous. Where possible sowing should be carried out after rains, or when the soil is moist, in order to give the crop a suitable start.

Harvesting.

Judgment must be exercised in deciding the time at which to cut for forage, and for all purposes care must be taken to harvest at the correct

period. This should be the stage at which the crop is richest in nutrients, the most palatable and digestible.

When the majority of the seed-heads or panicles have formed in the green pendulous stage is the correct time to cut for green fodder. It is better to err on the side of greenness, though millet cut too green has a laxative effect on stock; if too ripe there is a possibility of the feed becoming unpalatable.

The green crop contains much moisture in both stalks and foliage, and in consequence takes longer to cure than ordinary wheaten hay. If the crop is intended for silage, it may stand a little longer after heading out, but it must be cut prior to ripening.

Fodder Value.

Millet is one of the most nutritious and attractive of summer green fodders, and it is available at a time when the spring grasses may have failed, and green fodders may be scarce. As green feed, hay or silage, it is very useful for dairy cattle, sheep, and young stock. For grazing it has been found to be excellent for sheep and cattle. Millets have no poisonous qualities, like sorghum, and may be fed when quite young. It is best, however, not to start feeding off until the crop has attained a height of at least 6 inches. After it has been well eaten down the stock should be removed until another growth is made. With suitable weather conditions, this should be only a matter of days, as the growth is rapid.

New Records in Wheat Areas and Production in Australia.

According to the recently issued Commonwealth Production Statistics Bulletin the area under crop for 1930-31 was a record one, amounting to 25.2 million acres, as compared with 21.9 million acres for the previous year. This represents an increase of 3.3 million acres or 15 per cent. The increase of acreage was almost entirely in wheat, and this increase is a rather remarkable reaction to an unexampled collapse in wheat prices to half the average price of the previous ten years. Seasonal conditions were, however, promising, the last crop had been very light and the chances of good yields high. In these circumstances farmers were not likely to lose by seeding all available land, even though the price was too low to contribute anything to overhead costs, and the advice given by the experts was to increase acreage to the maximum. This was reinforced by an appeal from the Government to increase exports in order to maintain external solvency. The result was that the area under wheat rose from 14,977,000 acres in 1929-30 to 18,165,000 acres in 1930-31, which represents an increase of almost 3.2 million acres or 21 per cent. The area devoted to the cultivation of wheat for grain is slightly more than 72 per cent. of the total area under crop.

The season generally was favourable to agriculture and yields were high. The wheat crop was 213 million bushels, the greatest crop yet recorded in Australia, and exceeding that of the previous record year (1915-16) by more than 34.5 million bushels, or 19 per cent. The average yield per acre was 11.76 bushels, as compared with an average for the decennium ending 1930-31 of 11.65 bushels.

The Milling Qualities of Wheat.

E. GRIFFITHS, B.Sc., Chief Chemist, G. W. NORRIS, Assistant Analyst, and H. WENHOLZ, B.Sc.Agr., Director of Plant Breeding.

WHEAT is most largely used for milling into flour for the manufacture of bread, biscuits, pastry, etc. It is therefore valued chiefly in relation to the characters or qualities which determine its desirability for milling. These characters are worth some consideration by the grower who wishes to obtain the highest price for his wheat, and the wheat breeder should give some attention to producing varieties which have the qualities the miller desires as far as is compatible with the qualities required by the grower. Of the above uses of flour, that of bread manufacture is by far the largest, and in addition to those characters which make a wheat suitable for the actual milling process, the miller also has to consider those qualities in the flour which the baker desires or demands.

Milling Requirements.

The first requirement of the miller is that the grain sample shall contain a high proportion of millable wheat. Cleanliness or freedom from foreign matter other than grain (viz., straw, chaff, weed seeds, etc.) is therefore the miller's first consideration. Soundness, *i.e.*, freedom from weevil injury, smut, immaturity, frost damage, broken grain, storage damage (heating or bin burning), sprouting, bleaching, or weather discolouration, is also important to the miller, while plumpness, brightness and uniformity of grain are other desirable features.

These are characters which determine the general quality or grade of the wheat sample, but we are here chiefly concerned with the characters of the actual grain which determine its value to the miller. A high yield of flour is one of the most important requirements. This depends most largely on the bushel weight of the wheat, the higher the bushel weight the higher, generally, the flour yield. A high bushel weight of clean wheat depends considerably on the plumpness of the grain, although it is influenced also by minor characters such as texture and shape and size of grain. Hard wheats are generally of higher bushel weight and, as a rule, yield a higher percentage of flour than soft wheats. When conditioned properly, hard wheats mill freely and cleanly, while in soft coarsed-branned "woolly" wheats, the flour is more difficult to separate cleanly from the bran.

Millers endeavour to standardise their product for sale to the baker by blending different wheats, so that they can supply him throughout the year with a uniform quality of flour for which he does not need to alter his baking process. They have therefore become more or less skilled in blending wheats of different quality to make a uniform sample which also does not entail much alteration in the milling process. To do this, millers have to estimate or determine the quality of different samples of wheat. Some

millers trust to the estimation of the wheat on appearance, bushel weight, colour, soundness, brightness, hardness, etc., and a knowledge of the variety and its source to determine its quality and relatively how much of it should be used in blending. Others, however, attempt to arrive at the baking quality of the wheat more accurately by the determination of the gluten or protein content or by other means.

Protein as a Guide to Baking Quality.

It is easy to differentiate between soft and hard wheats on their appearance, and grain of soft starchy appearance or texture can generally be classed as of low baking quality, but hard grain of horny appearance or vitreous texture cannot be invariably classed as of high baking quality. The protein content of wheat is somewhat related to the baking strength of the flour, although it is not a regular index of loaf volume or baking quality. It has been shown that flour strength depends both on the quantity and quality of gluten in the flour—or on the quantity and quality of the protein in the wheat, since the protein content of the wheat is generally related to the gluten content of the flour. A wheat of low protein content usually indicates low flour strength and poor baking quality. Dr. Kent-Jones states that the gluten content of flour for satisfactory baking in England should be over 10.5 per cent. This would probably require wheat of a protein content of 11.5 to 12 per cent. Although satisfactory bread is baked in Australia from flour containing less than this percentage of gluten or protein, it is likely that flour containing a higher percentage would yield a loaf of better quality. A wheat of high protein content does not always indicate high baking quality, for unless the quality of gluten is also good, an excellent loaf cannot be baked from such wheat.

Much work has been done in the United States and Canada to show the correlation between protein content and baking quality, and although it may be true that such a correlation exists with wheats of similar gluten quality, it cannot be expected that a close relation between protein content and baking quality will be found in wheats which differ markedly in the quality of their gluten. Wheat or flour of moderately high protein content with a good quality of gluten is probably the best type for the miller and the baker to handle without blending, but wheat of high protein content and quality is of the highest value for blending with weak flour wheat, and has what is called "reserve" strength. The Manitoba wheat of Canada is of the highest value in this respect.

High protein content is not only a general indication of baking quality, but it is usually also an indication of good water absorption of the flour, that quality so much desired by the baker, in order that a large number of loaves of good volume can be made from a sack of flour. High protein wheat is also generally capable of furnishing a dough which will stand up to the modern high speed dough-mixing machinery of large commercial bakeries, and such wheat is also preferred for use in the manufacture of "wholemeal" bread. Wheat of high protein content has therefore so many advantages to the baker with modern equipment, that he has recently been making a

greater demand from the miller for flour containing those properties which are generally associated with this type of wheat.

In the United States, millers are frequently forced, on account of its scarcity, to pay a good premium for high protein wheat for blending with the more abundant low protein wheat to raise the general level of their flour strength to meet the standard demanded by the bakers. In Australia, it is well known by millers that certain districts, viz., the drier districts, produce wheat of higher protein or gluten content than others, and they purchase their requirements to some extent on this basis. This is a safe basis to work on in Australia while varieties of wheat do not differ greatly in gluten quality. High protein may be largely due to the effect of a dry climate, but flour strength is also influenced by the variety, and country millers have recently begun to recognise this by paying a premium of 3d. or 4d. per bushel for certain varieties produced in their immediate districts.

A very judicious and skilful blending of wheat is required on the part of the miller in order that he may give the utmost satisfaction to the baker, and since he cannot do this efficiently by determination only of the protein content, he has searched for other qualities in the flour which might assist him in this regard.

Before milling a wheat, the miller must condition or temper the grain by treatment with water and heat so as to toughen the bran and obtain its separation in broad flakes. Soft wheats do not require nor do they stand as long a conditioning period as hard wheats, as they may easily become "waterlogged" by the water soaking into the endosperm, and thus rendering it unsatisfactory to mill. Dry hard wheats may require many hours' tempering to thoroughly toughen the bran to prevent it fracturing into tiny pieces when being milled.

Flour Characters and Flour Tests.

Although it has been recognised for some time that no single character of wheat or flour is likely to be an accurate guide to the complex character known as baking quality, certain tests are made by the miller of the qualities or properties of flour, chiefly for his guidance in estimating its baking quality for the more successful blending of wheat. The protein content of the wheat can be determined much more accurately than the percentage of dry gluten in the flour, and it is for this reason considered preferable as a basis for blending, except where some idea is required of the nature of the gluten. This, however, is also determined more accurately by dough tests than by handling, examination or testing of the gluten itself. In addition to protein or gluten content, other characters of the flour have been determined, and some of these are of certain significance to the miller or to the baker.

Some indication of the character of the flour is indicated by its feel and appearance. A strong flour is somewhat "sharp" to the touch and "lively" in its flow, while a weak flour is softer and more sluggish. A weak flour has generally a whiter colour than a strong flour, which is more yellow.

Australian wheat is especially valued in Great Britain for the superior creamy whiteness and bloom of its flour, which is said to be absent from the strong flour of hard Manitoba wheat. The general practice of flour bleaching overcomes the objection to a yellow colour of the flour, but bleaching affects the bloom, and some importing countries discriminate against the use of bleaching agents in the flour. Even Australian wheats differ in this respect, and it is important to know whether a variety has any objectionable colour in its flour.

The ash content of milled flour is usually about 0.4 per cent., but the bran of wheat has an ash content of over 5 per cent. A high ash content in the flour sample carries a suspicion principally of too close a milling, and this is corroborated by the flour being of poor colour due to specks of bran distributed through it. A low ash content and a clean bright flour with a high protein content is generally an indication of good flour quality, though opinions differ about the ash content.

The viscosity of a suspension of the flour in water is another test used by some millers to determine flour strength. It has been considered that the ratio between flour and water used in the suspension corresponds to the relation between dough consistency and water absorption of a flour; but it has been shown that while this relation holds to some extent in the case of weak flour, it is erroneous when higher quality flours are used.

Value of Milling Tests.

In most countries where an endeavour is being made to improve the baking quality of wheat, laboratory milling and baking equipment is used by cereal chemists to test the value of different wheats. While there are some differences of opinion as to the reliability of a laboratory mill in obtaining milling results which are in line with those obtained in a commercial mill, it is generally acknowledged that determination of dough or baking quality can be done accurately with flour produced in a laboratory mill. These determinations are unquestionably of value in gaining at least a preliminary knowledge of experimental samples of wheat, and at least serve the purpose of eliminating strains and varieties of wheat which do not give good results; but it is advisable when a sufficient quantity of wheat is available to subject it to commercial milling and baking for a final practical estimate of the variety.

The laboratory observations, milling tests and flour determinations which may be considered to be of use in indicating to the miller the value of a sample of wheat or flour or of a new variety of wheat are:—

Grain Sample—

1. Cleanness.
2. Size, colour, plumpness, brightness, soundness, texture and uniformity.
3. Test weight per bushel.
4. Percentage of moisture.
5. Percentage of protein (determined to a common moisture content).

Mill Products and Flour—

1. Percentages of flour, bran and pollard.
2. Character of bran.
3. Character of flour.
4. Colour of flour.
5. Percentage of dry gluten in flour.
6. Percentage of ash in flour.

It must be realised, however, that milling or flour tests of themselves, whether the milling is done in a small laboratory mill or in a commercial mill, determine mostly the milling qualities or properties of the wheat sample and do not give much indication of its baking qualities. Without dough tests or laboratory baking tests, the baking quality of a wheat cannot be estimated with any degree of accuracy.

For many years wheat breeders in most countries have relied on percentage of protein or dry gluten determinations as a means of selecting wheats of good baking quality. It is now known that this character alone is not a reliable indication of baking quality, since it takes no cognisance of the quality of gluten. The wheat breeder has long been seeking a simple test which would give a reliable estimate of gluten quality or baking quality. It is only quite recently that such a test has been devised, and this test (the Pelshenke dough test) is now used in the New South Wales Department of Agriculture to give a preliminary estimate of baking quality and inherent quality of gluten on a small sample of grain. This is followed by laboratory milling and baking tests when a larger quantity of grain is available.

The characters of dough and the value of dough tests in estimating the baking quality of wheat will be dealt with in a subsequent article.

Eradication of Blackberry.

When blackberry is well established, it is difficult to bring under control owing to the fact that the roots sucker freely. If, however, precautionary measures are adopted and blackberries are destroyed as soon as they appear, no very great difficulty is experienced in keeping them under control. Owing to the thorny nature of the plant, the work of "brushing" is very unpleasant. This can be overcome by spraying the plants with a suitable poisonous solution and burning when they become dry. Further applications of the spray can then be given to destroy the young plants, or these can be hoed out. The spraying must be thorough, and where the growth is dense and extensive it will be necessary to cut a track through it first.

Sodium chlorate at the strength of 1½ lb. to 1 gallon of water has proved the most effective spray. The best time to apply it is in the early summer, when the vines are making active growth and showing numerous leaves. At this stage the foliage absorbs the solution quickly and the plant dies rapidly.

Where the land is suitable for sheep, young plants can be kept down by keeping a few crossbred wethers or running goats in a paddock. Kikuyu grass sown after burning helps to smother the suckers.

Recording Disease in Crop Plants.

[Continued from page 808.]

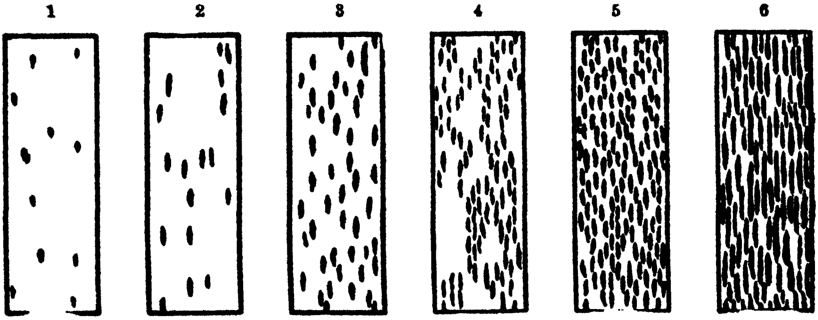
S. L. MACINDOE, B.Sc.Agr., Assistant Plant Breeder.

Part II.—Cereal Rusts.

THE importance of securing adequate field observations on the reaction of varieties or strains of cereals to rust has been considerably increased with the recognition of the fact that the reaction of the variety tested in the seedling stage may be very different from that of the same variety subjected to rust attack in the field at or after heading time. Moreover, recent work has demonstrated very clearly the importance of temperature and other climatic and nutritional factors in determining the host parasite relationships which govern disease resistance. For example, certain varieties of wheat or oats inoculated with known rust forms have been shown to give every variation in reaction from completely resistant to completely susceptible according to the temperatures to which the host plant is subjected after inoculation. Under field conditions there are also indications that environmental factors may modify the reactions of some varieties to rust.

It is obviously very desirable, therefore, that field observations should be made on the behaviour of varieties to rust over as wide an area as possible. In order that observations made in one district may be of value to workers in other localities it is necessary that notes on rust should be taken on a more or less uniform basis. The necessity for making comparative observations only between varieties grown under strictly comparable conditions and ripening simultaneously need hardly be mentioned.

1 2 3 4 5 6



5 per cent. | 10 per cent. | 25 per cent. | 40 per cent. | 65 per cent. | 100 per cent.

Diagram showing six degrees of rustiness, used in estimating the percentage of rust infection on leaf or stem. The shaded spots represent rust and the figures represent approximately the rust percentages computed on the basis of the maximum amount of surface covered by rust, as shown in the 100 per cent. figure. This figure (No. 6 in the diagram) represents 37 per cent. of actual surface and is arbitrarily selected as 100 per cent. Other percentages are in terms of No. 6.

Through the courtesy of Canadian rust workers the writer was fortunate in being able to attend a conference held at the Dominion Rust Research Laboratory, Winnipeg, Canada, during August, 1931. At this meeting,

methods of standardisation in recording rust reactions were fully discussed and demonstrated. With minor modifications the system adopted at this meeting was very similar to those which had been in use for three years in New South Wales.

The major points to be considered are as follows:—

(1) The percentage of rust pustules are recorded on the basis of the chart published by the United States Department of Agriculture and reproduced here.

(2) In taking large numbers of observations locally it has been found convenient to use the diagrams as representing the means of six classes, into one of which any variety is thrown. This has been possible because of the epidemic conditions under which observations have been made. Under these conditions the following designations have been given to the percentage classes:—

0 per cent. infection	... Rust free.
1 ,, ...	... Trace.
5 ,, ...	... Very light infection.
10 ,, ...	... Light infection.
25 ,, ...	... Moderate infection.
40 ,, ...	... Heavy infection.
65 ,, ...	... Very heavy infection.
100 ,, ...	... Extra heavy infection.

(3) Where finer differences are desired percentage readings may be given in intervals of 5 per cent. with the exception that 1 per cent. may be used to indicate a trace.

It has been customary locally to bracket varieties showing a trace (1 per cent. infection) with rust-free varieties. It has now been decided, however, to separate these two groups since frequently varieties which are, for example, extremely highly resistant to stem rust of wheat may carry an occasional pustule just above the node or on the awn. Such cannot be classified as rust free, but they are distinctly more resistant than some other strains which show very light infection.

At the Canadian conference previously referred to some of the following points were also discussed.

(4) Notes on pustule type should be included in addition to the percentage infection, capital letters being used to indicate the following types of pustules:—

S	... Susceptible.
M.S.	... Moderately susceptible.
Int.	... Intermediate.
M.R.	... Moderately resistant.
R	... Resistant.
X	... Mixture of pustule type not due to the mixed reaction of different, physiologic forms.

Levine[1] has gone further and has attempted to express as a "coefficient of infection" the combination of percentage of infection and pustule type. Although the above notations are made locally when distinctive pustule types are encountered, it is usually when tabulating results to throw varieties into classes on the basis of both percentage infection and

pustule type. Thus under severe rust conditions Webster wheat may show 25 per cent. infection, but in view of its resistant pustule it may be classified as showing "light infection."

(5) Notes should be taken as frequently as possible. Stem rust notes are best taken about a week or ten days before ripening. It is important that notes should be taken when the varieties are at the same stage of maturity.

(6) Where the range in percentage infection is given for a certain plot it is desirable that an average figure for the plot should be given also. It has not been found necessary or desirable locally to record the range of infection.

(7) Where mixtures are present in a plot, notes should be taken on the differences in reaction of the different strains present. Types of reaction caused through abnormal conditions for growth should also be noted separately.

(8) At Glen Innes irregularity in the infection occasioned through differences in soil type, etc., has frequently necessitated adopting a standard reading for a check variety which is planted throughout the field.

Adjacent varieties are then recorded in relationship to the standard. This practice may be abused by attempting to make observations when infections are too light, but if used judiciously the method can be used with great advantage. The use of the same standard or standards from year to year also enables comparisons to be made between observations made in different seasons.

(9) At Glen Innes it has been also found desirable at times to take notes on the grain samples of all strains in the rust nursery. Plumpness of grain has been recorded on a scale of 0 to 1. Thus, for example, a plump grain sample is classified as 1, when only half filled as .5 and when only the shell or bran remains as .1. Such notes should only be taken when the pinching of the grain is clearly due to the rust under observation and not to other diseases such as foot rots, etc. The advantage of noting plumpness of grain lies in the fact that certain varieties appear to show a comparative tolerance to rust attack. Some varieties are also "late rusters" and consequently suffer little from the late invasion by the rust organism.

LITERATURE CITED.

[1] LEVINE, M. N., *et al.*—
1930, "Field Studies on the Rust Resistance of Oat Varieties," U.S.D.A. Tech. Bulletin No. 143.

(To be continued.)

MUSHROOMS should be picked when the membrane below the gills is just commencing to break—the flavour is best at this period. All butts or broken stems should be removed from the bed when picking, as they attract insects.

Flowering, Pollination, and Natural Crossing in Rice.

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THE following article presents in outline the results of some five years' observations made during the course of improvement work with rice in the departmental stud plots at Yanco, in the Murrumbidgee Irrigation Area, and briefly compares these with similar observations made in other rice-growing countries. Literature dealing with rice is remarkable for the diversity of opinion expressed by workers with this crop on such aspects as time of flowering, relationship between glume dehiscence and pollination, extent of natural crossing, etc. Jones[6], in his review of this literature, ascribes the varying behaviour of rice in different parts of the world to varying local conditions, and to varietal peculiarities. It may therefore be of interest to report observations made under growing conditions which, in one respect at least, are apparently unique.

One of the principal objectives of the observations at Yanco has been to determine the precise conditions under which artificial hybridisation could be effected with maximum success. The varieties chiefly used were Caloro, Colusa, Carolina Gold, Carolina White, and Lady Wright. The first two are typical Japanese medium long grained varieties, while the Carolinas and Lady Wright represent the long-grained types. Pure strains of these varieties were used, classified as follows regarding time taken to mature.

Early.	Mid-season.	Late.	Very Late.
175–180 days ...	180–185 days ...	185–190 days	190–195 days.
Colusa Y180 ...	Caloro Y316	Caloro Y46, Carolina White, Lady Wright.	Carolina Gold.

Flowering.

Jones cites observations by many workers, and times of maximum flowering ranging from 8-9 a.m. in Burmah (Thompstone) to 12-2 p.m. in California (Jones). The earliest and latest hours range from 5 a.m. in India (Ramiah) to 4 p.m. in California (Jones) and Texas (Laude and Stansel). Minimum temperatures for flowering are given, ranging from 59 deg. Fahr. in northern Japan (Akemine) to 77 deg. Fahr. in different parts of India (Bhide, Ramiah, Rao). Of the writers cited by Jones comparatively few give temperatures at which maximum flowering occurs; most, according to Jones, merely stating times. Ramiah is quoted as specifying 82 to 84 deg. Fahr., time varying, in India; Kobayasi 86 ± 3.6 deg. Fahr. in Japan, while Akemine, also in Japan but working with a different variety to Kobayasi, specifies 95 to 104 deg. Fahr. as optimum.

Noguti (formerly Kobayasi) alone is quoted as giving the relationships of both temperature and humidity to flowering. This worker, who appears

FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

Departmental herds include the following Stud Bulls :—

Guernsey : HOPEFUL OF WOLLONGBAR (499), Champion, R. A. Show, Sydney, 1928. *Ayrshire :* SCOTTISH PRIDE OF GOWRIE PARK (3797), First and Champion, R. A. Show, Sydney, 1927; First and Reserve Champion, R. A. Show, Sydney, 1928. *Milking Shorthorn :* MORNING STAR OF DARBALARA (Vol. 8), Second, R. A. Show, Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522.5 lb. milk, 1,614.1 lb. butter fat in 365 days. *Jersey :* FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

The Department has for sale young bulls from tested dams of the following breeds :—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

Application should be made to—THE UNDER SECRETARY, Department of Agriculture, SYDNEY

to have made a most comprehensive study of the subject, in a translation of the original paper[8], states that flowering takes place when the temperature at 8 a.m. amounts to about 80 to 83 deg. Fahr., increasing in activity up to 90 deg. Fahr., almost ceasing above this temperature, with 122 deg. Fahr. as maximum limit. Some of these observations were made in a thermostat; 70 to 80 per cent. is given as the most favourable degree of moisture, and the sudden change in humidity in the morning is said to be soon followed by the main flowering period. Below 70 per cent. moisture the number of florets opening is diminished, but flowering occurs even at 50 per cent., though rarely below 65 per cent. The temperature given, 86 ± 3.6 deg. Fahr., is said to be the optimum for flowering if the air moisture is below 70 per cent.

At Yanco rice has not been observed to commence flowering at a temperature below 72 deg. Fahr., humidity 62 per cent. It has been found that, in general, the lower the humidity the higher the temperature required to initiate flowering. Thus, with a humidity of 32 per cent., the temperature required was 81 deg. Fahr. Optimum conditions for flowering at Yanco appear to be a temperature of 85 to 90 deg. Fahr. and a humidity of 55 to 70 per cent. This humidity is lower than that given by Noguti (or Noguchi), but the temperatures are similar. No varietal differences have been observed—the conditions which initiated flowering in any one variety have invariably brought it about in others at the same stage of development.

The maximum temperature and humidity for flowering have not yet been accurately determined at Yanco because by the time the temperature has risen to any high value in the field, the supply of florets ready to open has usually become exhausted. The highest temperature observed at which flowering occurs is 102 deg. Fahr., humidity 60 per cent., but there is no reason to suppose this the limit.

The time of day at which flowering commences varies very widely, according to weather conditions; on a bright, clear day, with little or no wind, it usually commences between 8 and 9 a.m., reaches a maximum between 11.30 and 12.30 p.m., and ceases between 3 and 4 p.m. It has, however, been observed to occur at 6 a.m., with the maximum period between 9 and 10 a.m., and as late as 5.30 p.m. Wind and cloud, if slight, have the effect of postponing flowering, and if marked, can prevent it entirely; rain has a similar but more severe effect, in contrast to Noguti's experience in Japan. The amount-of-flowering curve follows the humidity curve with remarkable fidelity, but with a slight time-lag, as though the actual *variation* in humidity were an important factor.

Considerable evidence, which it is hoped to present in detail in a later article, is accumulating to indicate that between temperatures of 72 and 100 deg. Fahr. (and probably higher) humidity plays the principal part in determining the amount of flowering, and that other relevant factors act through humidity. For instance, wind arising while flowering is in progress has usually had a restricting effect, even though the temperature has risen.

Pollination.

From a review of the literature, Jones concludes that pollination just before or at the moment the flowers open is most usual, with comparatively rare cases in India (Bhide, Parnell, Parthasarathy) of pollination of some florets on a panicle after opening. This is also found to be the normal state of affairs at Yanco. Usually, in florets due to open on a given day, the anthers occupy a position about half-way up the glumes (in a short-glumed variety like Caloro, relatively less in a long-grained variety) in the early morning of that day. When suitable temperature and humidity are reached the anthers can be seen approaching the apex of the glumes, the time taken from the half-way position to reach one nearly touching the apex varying from thirty minutes at temperatures in the vicinity of 75 deg. Fahr., and comparatively high humidity, to two minutes or even less at about 90 deg. Fahr., humidity about 50 per cent. When the anthers almost touch the apex the glumes suddenly dehisce and spring apart as though under tension, their inner edges forming an initial angle of about 10 degrees. The tension appears to be provided by the lodicules which, as Akemine, according to Jones, reports, have swollen to about three times their former size at this stage. Through the opening thus made the anthers immediately commence to protrude.

At this stage three types of pollination can be distinguished:

1. The anthers have burst, and pollination has taken place. This is comparatively rare at Yanco; it has been observed only when the temperature is high (in the vicinity of 95 deg. Fahr.), and the humidity low (30 to 40 per cent.), which set of conditions has occurred usually only late in the afternoon, towards the close of the flowering period, when a steady hot dry westerly wind has arisen.

2. Anthers burst as they emerge, or within a few seconds, and pollination follows as the glumes continue separating. This is the most usual occurrence throughout the season and during the daily maximum flowering period with all varieties. The observed temperature range is 80 to 100 deg. Fahr., humidity 45 to 50 per cent.

3. At temperatures between 72 and 90 deg. Fahr., with humidity over 60 per cent., and particularly when the humidity has fallen steeply from a high value just prior to flowering while the temperature has risen, the anthers emerge unbroken, even damp. These conditions are comparatively rare at Yanco, occurring for any noteworthy period only on infrequent dull hot days, but more often for a short period in the mornings, about the commencement of the flowering period.

The filaments elongate rapidly, carrying the anthers out of the flower; practically erect at first, the weight of the anthers bends the filaments over between the separating glumes. The anthers commence to dehisce at some stage in this process; in extreme, but not infrequent cases, they are quite clear, and below the level of the floret. Pollen, in this case, is then very unlikely to fall on the stigmas of the same floret.

These three types are not clearly defined, but merge into one another. For instance, it happens sometimes that one set of three anthers bursts at emergence, the other triplet a few seconds later, when quite emerged. The actual dehiscence of the anthers is not violent; it commences at the basal end, and pollen spills out gently as the split extends along the anther. A slight change occurs in colour as the anthers mature, from a light yellow at the "half-way position" (previously green) to a pale cream, almost white, the colour of the ripe pollen. The angle between the glumes, in the meantime, gradually increases to about 30 degrees, very slowly towards the end, the total time occupied being about 60 to 180 seconds. Fruwirth is reported by Hayes and Garber[3] to specify 30 seconds, while Copeland[4] reports Mendiola as giving 6.5 to 6.9 minutes in the Philippines. The feathery stigmas gradually curve over, one to each side, and protrude in the angle between the glumes, covering the lodicules; they are usually slightly moist from the time they first become visible. In the usual course of events pollen falls thickly on the stigmas; in a few minutes this pollen changes colour from a pale cream to golden, even to a slightly orange tint, probably owing to absorption of moisture from the stigmatic surface and germination.

The flower remains open for a time varying from 13 to 75 minutes; this time, also, appears to be governed by the relative humidity of the air—the time is shorter at low humidity, and longer at high. The effect is probably due to desiccation of the lodicules, resulting in gradual slackening of the tension holding the glumes apart. Mendiola[6] gives the time the florets remain open as fifteen minutes to two hours in the Philippines, Chiapelli[1] one to two hours in Italy, Akemine, according to Jones, one and a half to two and a half hours in Japan. The glumes gradually close, pinching the flaccid filaments, and usually the withered or withering stigmas, one on each side, between them; these are not immediately severed, however, but usually persist for some time before falling. The glume edges do not interlock again until some hours after the floret has closed, usually the following night, when (and only if) the fertilised ovary has commenced to swell.

Pollination has not been observed to occur without opening of the floret, though Mendiola[7] and Jones, reviewing observations in the Philippines, Java, India, and Italy state that closed pollination (cleistogamy) occurs in some varieties.

There is some difference in pollination among the varieties observed: the tendency of florets to open without immediate dehiscence of the anthers is more marked in long-grained varieties, because the distance the anthers have to be carried before reaching the apex of the glumes is greater, and in the meantime these have possibly opened. The sudden dehiscence of the glumes may be a means of bursting the ripe anthers, which are probably less susceptible to shock when not in close contact with the apex.

Natural Crossing.

Jones, in concluding his review of literature on natural crossing, states: " . . . natural crossing in rice ranges from practically none in Hawaii

and California to as high as 23 per cent. in Java. Climatic conditions appear to have a marked effect upon the extent of natural crossing. In Japan and Java high humidity and low temperatures seem to favour natural crossing, while low humidity and high temperature are more favourable for autofecundation. The extent of natural crossing in rice also depends upon the peculiarities of the variety grown, as was observed in Japan and Java. Other external factors which influence the extent of natural crossing in rice are wind velocity, rain, and insects of various kinds which visit the florets while in bloom."

Mendiola[7] states that natural hybrids are being continually produced in the Philippines, and ascribes to the effects of natural crossing the unsteady yield performance of different supposedly pure lines. Jones reports Ikeno, in Japan, as concluding that "crossing is very rare in nature," while Hoshino[4], quoting Kato, also in Japan, states that natural crossing often occurs.

The great importance of natural crossing in accounting for the very numerous varieties of rice grown in the world, often many in one small district, and the constant occurrence of variations in commercial crops has been stressed by many writers. As a source of new varieties Mendiola[7] refers to natural crossing as "both the hope and despair of the rice breeder."

Natural crossing is known to occur at Yanco:

1. By the repeated discovery in supposedly pure lines growing in the stud plots, of variant types whose subsequent behaviour has shown them to be unfixed crossbreds.

2. By the diversity of types encountered in field crops, originally apparently homogeneous. To take a specific instance, by the rapid increase in the percentage of red rice in one variety, Colusa. The proportion increased from about .05 per cent. in 1926 to nearly 6.5 per cent. in 1930, when the variety was withdrawn from cultivation. Natural crossing must be invoked as an explanation, keeping in mind the Mendelian dominance of the red grain factor (s), for possible increase due to earlier ripening and shattering of a red-grained variety present as admixture will not hold, as weeds do not usually permit the growing of rice in two successive seasons on the same land.

3. By experiments carried out in the stud plots with varieties of similar maturity differing in some marked character. Caloro Y46 was grown in a row spaced 2 links (40 cm) from a late red-grained selection in 1930. Of 2,017 plants grown from seed from the Caloro Y46 row in 1931, nine were red-grained, equalling 0.044 per cent. natural crossing. Segregation counts in 1932 showed the particular red grain factor involved to be a simple Mendelian dominant. The rate of natural crossing is probably much higher under field conditions, where rice is drilled in 7 inches (18.5 cm.) apart, and plants touch one another in the drills. Further experiments are under way to determine this point, also to ascertain the maximum distance over which natural crossing can be expected to occur.

Temperature and humidity are certainly important factors influencing pollination, as pointed out under the previous headings "Flowering" and "Pollination," and therefore natural crossing. Wind is important as a ready means of conveying pollen over very considerable distances. Mendiola[7] gives a table showing the distances wind-borne pollen will travel at various wind velocities. He considers 6.5 feet (2 m.) apart a safe distance for sowing rows of different varieties to avoid natural crossing. Bees are frequent visitors to rice in bloom. I am indebted to Mr. P. C. Hely, Departmental Entomologist on the Area, for identification of the following insects observed in associaition with rice heads in bloom: Honey Bee (*Apis mellifica*), Pumpkin Beetle (*Aulacophora olivierii*), Black Flea Beetle (*Haltico ignea*), Rice Beetle (*Laius femoralis*).

SUMMARY.

Flowering.

1. Temperature and humidity are closely interrelated in governing flowering, and, within limits, in inverse ratio.

2. The minimum temperature at which flowering occurs is 72 deg. Fahr., if the humidity is not less than 62 per cent.

3. Maximum flowering occurs when the temperature is 85 to 90 deg. Fahr., and humidity 55 to 70 per cent.

4. The highest temperature at which flowering has been observed to occur is 102 deg. Fahr., humidity 60 per cent.

5. The response of all varieties observed to a given set of conditions was the same.

6. The time of flowering varies with weather conditions; it usually commences at 8.30 a.m., reaches a maximum between 11.30 a.m. and 12.30 p.m., and ceases about 3.30 p.m.

7. Observed extremes in flowering time are 6 a.m. and 5.30 p.m.

8. Wind, clouds and rain adversely affect flowering.

9. Relative humidity is the most important factor governing the amount of flowering between temperatures of 72 and 100 deg. Fahr. The variation of humidity appears to play some part.

10. The normal humidity during the flowering period of rice is unusually low at Yanco in comparison with published data for other countries.

Pollination.

1. Three types of pollination occur—
   (*a*) Before the florets open—when the temperature is high (about 95 deg. Fahr.) and humidity low (about 35 per cent.); rare.
   (*b*) At opening of the florets, or within a few seconds—when the temperature is 80 to 100 deg. Fahr., and humidity 45 to 50 per cent.; usual.
   (*c*) After the florets have opened—when the temperature is between 72 and 90 deg. Fahr., and humidity high (over 60 per cent.); not infrequent.

2. The glumes open to a maximum angle of about 30 degrees in from one to three minutes, and remain open for thirteen to seventy-five minutes. This time is apparently governed by the relative humidity of the air.

3. Cleistogamy has not been observed to occur.

4. Pollination is more likely to occur after, rather than at, opening of the florets in long-glumed varieties than in short-glumed varieties.

Natural Crossing.

1. Natural crossing is known to occur at Yanco—
   (*a*) By the discovery of occasional heterozygotes in supposedly pure lines.
   (*b*) By the diversity of variant types increasingly occurring in commercial crops.
   (*c*) By experiment in the stud plots; 0.044 per cent. natural crossing observed at 2 links (40 cm.).

2. In addition to temperature and humidity, wind is an important factor.

3. A list is given of insects observed in association with rice in bloom.

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"A STUDY OF EMPIRE WOOL PRODUCTION."

FROM 1928 to 1931 a survey of most of the principal wool-producing areas of the Empire outside Great Britain, to study the numerous factors which influence the rationale of production, was made by Dr. J. E. Nichols.

His report has now been published by the Wool Industries Research Association, Torridon, Headingley, Leeds. It is divided into three parts, discussing respectively the general conditions under which wool production occurs; the phases of wool production in Empire countries (individually); and wool improvement and the methods of development of its production. Our copy from the publishers.

Soil Erosion.

Contour Drains Will Control it on Wheat Land.

[Continued from page 805.]

L. JUDD, Manager, Temora Experiment Farm, and H. J. KELLY, Manager, Cowra Experiment Farm.

In a previous article Messrs. Judd and Kelly discussed the damage resulting from and the causes of soil erosion, and, having recommended the use of broad base contour drains together with a system of farming that will build up the organic matter content of the soil as a means of preventing erosion, gave the principle points to be considered when deciding upon the locations of the drains.

In this issue they deal with the methods of taking levels for the drains by the use of a home-made "level," the construction of which is described.

It was mentioned previously that to attempt to lay out a drain by guesswork is to court failure, involving waste of time and energy. Satisfactory results, sufficiently accurate for all practical purposes, will, however, follow the use of the home-made "level," the construction and use of which are described below. When using the level one should not always be influenced by the apparent result, for when viewing the line of the drain set out from certain aspects it sometimes appears that an endeavour is being made to run the water uphill, but if the level has been accurately made and correctly used these observations will prove to be optical illusions.

Making the Level.

The timber with which a level should be constructed should be strong and light, and of a class that will not readily warp; Oregon pine is suitable for the purpose. In dimensions it should be 5-inch x 1-inch or 6-inch x 1-inch to ensure rigidity and accuracy; 3-inch x 1-inch timber is far too flimsy. The actual amount of timber required to make a level is as follows:—

One piece 8 feet long, for the upper stay.

One piece 11 feet 8 inches long, for the centre stay (on which rests the spirit level).

Two pieces each 7 feet 6 inches long, for the legs.

To commence the construction, select a barn floor which is perfectly level, or another suitable place, and mark off in pencil or chalk a base line 16 feet 8 inches long, driving a nail in at each end. Make a mark in the centre of this line, and then with a set square draw a line 4 feet 4 inches long at right angles to the base line. To test if this line is at right angles, measure from the top down to each nail; if the distances are equal the angle is correct. Now mark two lines, parallel to and of equal length to this one, on either side, at a distance of 3 feet 3½ inches from the centre line. Join the tops of these three lines with a pencil mark—this line should be 6 feet 7 inches long—and drive a nail in at either end.

The two legs are now put in position by placing the timber against th nails at the base and top lines, allowing the timber to protrude at each end; this allows of a clean edge being cut later with the saw when the requisite angle has been obtained. Now lie the piece of timber 8 feet long across the top of the legs, and directly along the top line previously drawn. This piece forms the upper stay. Nail securely at both ends. Place the piece of timber 11 feet 8 inches long across the legs parallel to the upper stay, leaving a space of 13 inches between the two pieces of timber. This piece forms the centre stay. Securely fasten at one end and temporarily nail at the other. This piece carries the spirit level, and will be finally secured when the frame has been tested.

Now cut off the legs where they protrude past the base line. This may be accurately done by placing a straight edge along the base line and resting over the legs, marking and sawing off. This gives the correct angle for the legs, which should then rest evenly when the level is in position for working. Stand the level up so that the legs rest at either end of the base line,

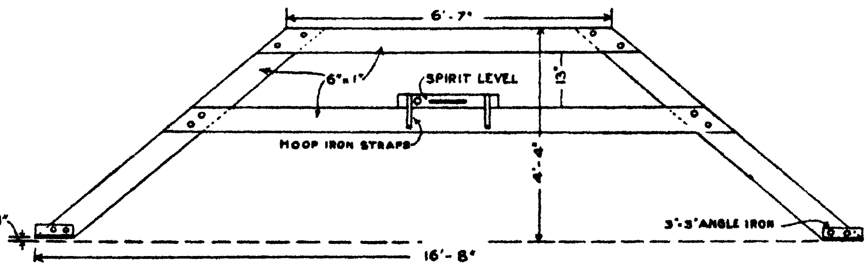


Diagram of a Home-made "Level."

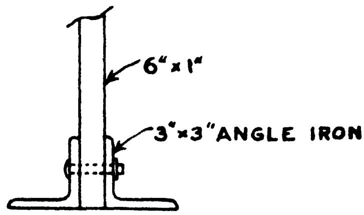
and with a spirit level placed on top of the centre stay, test for level. If the measurements are correct and the base is level, the reading should show "dead level"; if, however, the reading is not quite accurate, release the end of the stay temporarily nailed and adjust until the stay is level, and securely fasten. If any doubts exist as to the floor being perfectly level and the frame accurate, a test may be made in the following manner. Drive two pegs placed 16 feet 8 inches apart into the edge of a dam in the water, until the top of each peg is just level with the surface of the water. The water being "dead level" enables an accurate test of the implement to be made.

Bolt each intersection of the frame securely with one bolt, spacing the hole to admit of another bolt being added later. Raise the level on the base line again and test in case any movement has taken place. If correct insert a second bolt at each intersection.

Now to adapt this implement to the purpose it is intended for (finding the line of fall at the rate of 1 inch in 16 feet 8 inches) it is necessary that one leg be made 1 inch shorter vertically than the other. To do this, with the level quite upright and on a level base, place a piece of timber 1 inch in thickness against one leg and mark a line along the top edge on the leg;

aw this inch off the leg. Mark this leg to identify it permanently. It is also advisable to saw a "V" piece out of where the two stays meet this leg; these marks are very handy when reassembling the level should it be taken to pieces for transport or storage.

To preserve the legs and give a wider and better seating, bolt two pieces of small angle-iron to the bottom end, using care to see that the iron is set absolutely level with and parallel to the bottom of the leg. Four pieces of hoop iron secured in position where the spirit level is placed on the centre stay will hold the level in position while the frame is being moved about, thereby saving considerable inconvenience.



Detail of Angle-iron bolted to bottom of legs.

Preliminary Considerations Before Setting-out the Drains.

Before proceeding with any actual setting out work, make a detailed inspection of the paddock to be drained, in order to get a good general knowledge of the various grades and directions of the slopes. This will afford an idea of the volume and velocity of the water to be catered for. Next, definitely decide where it is intended to place the outlets for the drains, giving due consideration to the avoidance of cutting the paddock up more than necessary. At times central and intermediate channels must be left for the final disposal of water accumulated by drains, but as far as possible find outlets to roads, pasture paddocks, or drains in close proximity to fences. The value of making a careful study of the drainage problems the paddock presents cannot be too strongly stressed, for often careful consideration may obviate unnecessary cutting up of a paddock with main outlet drains.

To prevent the washing away of main drains or outlets, these should be converted into wide shallow drains and then laid down to Subterranean clover or lucerne or mixture of the two. Subterranean clover will be found to possess good binding qualities.

Construction work is best undertaken when the land is out to stubble or lay land, since the levels are then more easily taken. The land having been levelled down by the year's rain following seeding, a better base is presented for the feet of the level to rest upon, and travelling with the level is easier over firm ground. It will be readily appreciated that if the land is newly ploughed the taking of levels is hampered. Again, when using the grader or non-reversible delver and travelling back empty, it is far easier to travel over hard ground than over ploughed paddocks, while less damage is done to the surface. Any straw lying on the surface will be found very useful for filling in channels in badly eroded areas. Select, if possible, a time when the land is in moist condition for the making of drains, as it then grades better, consolidates more readily, and far less damage is done to the physical condition of the soil.

Pegging Out Contour Drains.

Drain making should commence at the highest end of the paddock, each successive drain being placed lower down until the bottom end of the paddock is reached. If a commencement were made at the lower end of the paddock, and rain fell before the work was completed, the lower drains would be called upon to convey the water from an area hopelessly beyond their capacity.

With the home-made level or frame, the requisite number of pegs for the work to be undertaken, and other equipment, a start is made on the top drain. Having previously decided the point of exit for the water, *i.e.*, the outlet for the drain, place the long leg of the frame at this point, and move the shorter (upper) leg up or down the grade of the paddock, pivoting on the long (or lower) leg, till the level shows "dead level"; then place a peg at the point where the short (or upper) leg rests. Move the frame along in the direction the drain is to be made until the lower leg rests beside the peg inserted—where the upper leg previously rested—and repeat the operation until the other side of the paddock or end of drain is reached. As the ground will vary in slope, the line of the drain will be found to wind about the paddock, the exact position being indicated by the line of pegs, and since one leg of the frame is 1 inch shorter than the other and the span is 16 feet 8 inches, the fall of the line of the drain is at the rate of 6 inches in 100 feet, or ½ per cent., which is the correct grade. A bucket will be found very handy for carrying the pegs and for holding them again when pulled up in the process of making the bank.

In a case where the paddock is too wide to permit of one long drain, or for some reason it is desired or necessary to take the water in opposite directions from a central or other specific point, select the first outlet as before described and continue in the normal way till the point is reached where the water must be carried in the opposite direction; then reverse the frame, turning it end for end, and continue till the outer outlet is reached. By adopting this practice a continuous line across the paddock results, whereas if the operation is discontinued at the watershed and an attempt made to work back from the other outlet, it is highly improbable that the two drains will meet. The efficiency of the drains would not be impaired if they did not meet, but for cultivation purposes and for appearance it is preferable to have one continuous drain, although the water is being conveyed in opposite directions. It may be necessary at times to put in spur drains to carry off excessive water, due to uneven slope at different ends of the paddock causing larger areas to be drained than the main drains provide for.

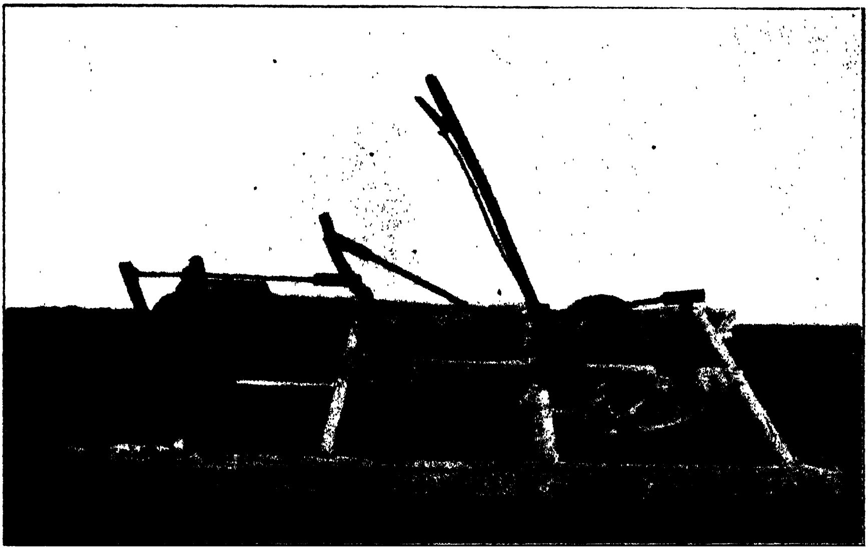
When the line of pegs which marks the site of the drain is examined, it will be found that a number of sharp, small bends occur. These are due to minor local depressions or rises; and although they are defined in pegging out, they can be ignored when marking the drain, and only the general contour line taken.

(To be continued.)

A Home-made Leveller or Grader.

H. J. DARGIN, Agricultural Instructor.

A HOME-MADE 3- or 4-horse leveller, mounted on wheels and raised or lowered by a compound system of leverage is in use at Yanco Agricultural High School. Details of the construction of, and an illustration of the implement, together with a diagram setting out the compound leverage system are given below so that farmers who have need of such a machine may either construct a similar one or apply the principle in utilising any parts of old machines that may be available.

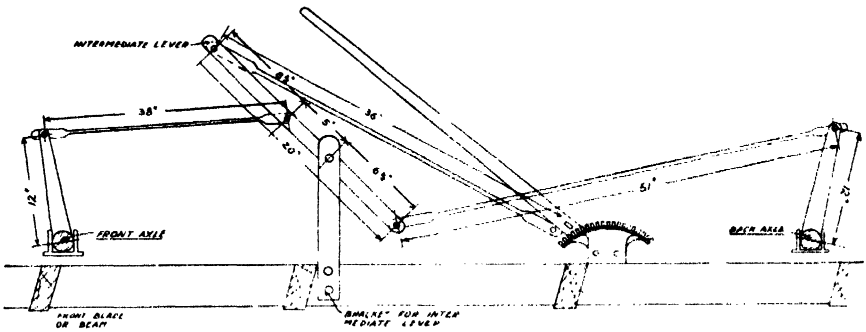


The Leveller used at Yanco.

The leveller illustrated has a length of 9 feet 3 inches and is 5 feet wide. It has four blades or cross beams, and all the woodwork is 5 inch x 2 inch hardwood; ½ inch bolts of various lengths are used throughout.

The cross beams are let ⅝ inch into the sides and bolted with angle iron; they are not set perpendicular, but ¾ inch closer to the front of the machine at the bottom of the sides than at the top. The distances apart (centres) of the beams from front to back are 2 feet 10 inches (front to second), 2 feet 8 inches (second to third), and 2 feet 10 inches (third to back). Steel cutting blades (4 inch by ½ inch) are bolted on to the lower portion of the front of the four beams, and the front end of each side piece is rounded off and protected with a piece of 4-inch x ½-inch steel plate (set level with the bottom edge) to prevent wearing.

Two steel cross stays are bolted from side to side in front of the first and third beams to strengthen the implement and a central longitudinal stay of 5-inch by 2-inch hardwood (which also carries the levers) is let into and bolted to the second, third and back beams. More strength would be obtained if the central longitudinal stay ran the full length of the implement.



Sketch Showing Arrangement of Compound Leverage System.

It will be seen from the illustration that two stays from the third to the back cross beam carry the back axle, which is bent, the straight portion being 3 feet 6 inches from bend to bend, while the two front wheels are held on a 1¾ inch steel rod and are placed 9½ inches from the sides of the leveller. The wheels used are 13½ inches in diameter with 3½-inch rims.

The accompanying diagram shows clearly the principle of the compound levers.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Dapto (E. G. Coghlan) ...	... Jan. 6, 7
Albion Park (H. H. Beattie)	... ,, 20, 21
Kiama (G. A. Somerville)	... ,, 25, 26
Wollongong (V. Stumbles)	... Feb. 2, 3, 4
Berry (G. Gillam) ...	... ,, 10, 11
Moruya (H. P. Jeffery) ...	... ,, 14, 15
Guyra ...	... ,, 14, 15
Pambula (L. K. Longhurst)	... ,, 15, 16
Shoalhaven (R. King) ...	... ,, 16, 17, 18
Milton (G. Prior) ...	... ,, 21, 22
Tenterfield ...	... ,, 21, 22, 23
Uralla ...	... ,, 22, 23
Newcastle (P. Legoe) ...	... ,, 22 to 25
Kangaroo Valley (L. W. Vance) ...	,, 24, 25
Yass (S. C. Sleeman) ...	... ,, 28, Mar. 1
Inverell (E. A. Clarke) ...	... ,, 28, Mar. 1, 2
Maitland (M. A. Brown) ...	... Mar. 1, 2, 3, 4
Robertson (W. G. Jenkin)	... ,, 3, 4
Taralga (W. N. Fitzgibbons)	... ,, 7, 8
Glen Innes ...	... ,, 7, 8, 9
Walcha ...	... ,, 8, 9
Berrima (H. Richardson) ...	... ,, 9, 10, 11
Rydal (H. Murray)...	... ,, 10, 11
Mudgee (T. P. Gallagher) ...	... ,, 14, 15, 16
Armidale ...	... ,, 14, 15 16
Cooma (G. E. Metcalfe) ...	... ,, 15, 16
Crookwell (A. G. McDonald)	... Mar. 16, 17, 18
Bowral (E. Walne) ...	... ,, 17, 18
Bellingen (J. F. Reynolds)	... ,, 21, 22, 23
Tamworth ...	... ,, 21, 22, 23
Goulburn (T. Higgins) ...	... ,, 23, 24, 25
Campbelltown (R. A. Sidman)	... ,, 24, 25
Quirindi ...	... ,, 28, 29, 30
Taree (C. A. Jackson) ...	... ,, 30, 31, Apl. 1
Dungog (W. H. Green) ...	... ,, 30, 31, Apl. 1
Gunnedah (R. A. Brown) ...	... April 4, 5, 6
Sydney Royal (G. C. Somerville)	,, 10 to 19
Kempsey (E. E. Mitchell)	... ,, 26, 27, 28
Gresford (A. R. Brown) ...	... ,, 28, 29
Orange (G. R. Williams) ...	... May, 2, 3, 4
Grafton (L. C. Lawson) ...	... ,, 2 to 6
Casino (E. J. Pollock) ...	... ,, 17, 18
Tullamore (W. J. Colville)	... July 26
Peak Hill (W. R. L. Crush)	... Aug. 1, 2
Trundle (D. Leighton) ...	... ,, 8, 9
Condobolin (J. M. Cooney)	... ,, 15, 16
Bogan Gate (J. T. a'Beckett)	... ,, 23
Parkes (L. S. Seaborn) ...	... ,, 29, 30
Forbes (E. A. Austin) ...	... Sept. 5, 6
Narrandera (J. D. Newth)	... Oct. 3, 4
Leeton (E. C. Tweedie) ...	... ,, 10, 11

Merino Ewe Competitions.

Results of the First State Championship.

J. M. COLEMAN, Senior Sheep and Wool Instructor.*

The first State Merino ewe championship conducted in New South Wales, the judging of which was completed at the end of October, was a successful one from every aspect. The number of individual entries received totalled over 440—far exceeding all expectations, for breeders were given very short notice of this initial contest.

In all sixty-eight local competitions were conducted, and some of these comprised more than twenty entries. It is regretted that one entry could

The Winning Team.
Entered by Mr. A. S. Wright, of Dubbo.

not be conveniently judged prior to shearing, but considering the limited time available for judging before the early sheds commenced, it was fortunate that only one competitor was missed.

The History of Sheep Competitions.

Sheep competitions in this State had their origin at Gilmore, near Tumut, where some few years ago the local branch of the Agricultural Bureau commenced annual sheep and wool competitions, and the idea was later adopted in several other districts, but without any uniformity in

* Mr. Coleman judged this championship competition.

regard to conditions. Having observed the educational value and the marked effect on production of such well-organised competitions as those conducted in connection with fallowing, fodder conservation, and the growing of various crops, and at the same time realising that there was ample room for improvement in knowledge in regard to sheep-breeding methods, I suggested to Bureau branches in June, 1931, that competitions should be conducted with uniform conditions, and district championships contested. Several branches, viz., Berridale, Gilmore, Duri, and Upper Manilla, conducted local competitions last year with the uniform conditions I suggested, and the two last-mentioned competed for a cup presented by the Advisory Council of the Agricultural Bureau for a northern championship.

The Entry of Mr. G. Constance, of Berridale.
Awarded Second Place.

The net result of these contests was considerable improvement in the competing flocks—clear evidence that sheep competitions had great educational value—and this fact prompted the organisation this year of competitions on a State-wide basis.

The 1932 Competitions.

The organising work for the 1932 competitions was undertaken by the *Farmer and Settler* newspaper, and assistance was given by the Agricultural Bureau, forty-two out of the sixty-eight local competitions being conducted by branches of the latter organisation.

For the grand championship of the State the following prizes were donated:—

First prize, a silver cup (value 25 guineas), presented by the *Farmer and Settler* newspaper.

Second prize, a silver cup (value 15 guineas), presented by Mr. C. B. Hearn, of the Colonial Mutual Life Assurance Society.

Third prize, a 5-guinea cup, presented by Mr. F. D. McMaster, "Dalkeith," Cassilis.

The conditions which governed the 1932 competitions were drawn up by the organising committee (Messrs E. A. Elliott, Sheep and Wool Expert; J. M. Coleman, Senior Sheep and Wool Instructor; and Gordon Bennett, Editor of the *Farmer and Settler*) in co-operation with the Advisory Council of the Agricultural Bureau. It will be seen that entry was restricted to owners of flocks of up to 2,000 ewes, of whom there are about 25,000 in the State, owning approximately fifteen million sheep.

The conditions were as follows:—

1. The entry shall be twenty-five Merino flock breeding ewes (fine, medium or strong), any age, bred by competitor and bearing his registered ear-mark.

The Sheep Exhibited by Mr. D. S. Bonnington, of Curban.
This Entry gained Third Prize.

2. Ewes entered for competition must not carry more than twelve months' growth of wool.

3. Ewes that have been agisted off owner's holding within twelve months prior to date of judging will not be eligible to compete.

4. Ewes with lambs at foot are eligible for competition, the judge to use his discretion in appraising condition.

5. Stud breeders who breed for sale are ineligible to compete.

6. Owners of flocks of over 2,000 shall be ineligible to compete.

7. Judging in district competitions will be carried out by Sheep and Wool Instructors of the New South Wales Department of Agriculture. Judging for New South Wales grand championship will be conducted by Mr. J. M. Coleman, Senior Sheep and Wool Instructor, New South Wales Department of Agriculture.

8. Judging for local competitions shall take place to suit conditions of different districts, but shall be between 1st July and 30th September of each year.

9. Entries shall close in each district not later than the second Saturday in June of each year.

10. The scale of judging points shall be as follows:—

	Points.
Type	60
Uniformity	20
Condition of wool	10
Condition of sheep	10
Total	100

11. The winning exhibit in each district will be eligible to be judged for the N.S.W Grand Championship.

The Championship Winners.

The winning flock, exhibited by Mr. A. S. Wright, of "Springwood," Dubbo, the winner of the competition conducted by the Buninyong branch of the Agricultural Bureau, consisted of beautiful ewes, carrying an attractive soft wool of 60's-64's quality. They possessed remarkable density, being particularly well covered on the extremities and bellies. The frames were all that could be desired, being deep and well sprung.

Second place was filled by Mr. G. Constance, of Berridale, who also represented a branch of the Bureau. These ewes had outstanding frames for Monaro-bred animals, and the wool, of 64's-70's type, was most stylish and of beautiful character. The ewes were very uniform as a group.

Mr. D. S. Bonnington, of Gilgandra, whose flock was placed third, presented ewes of outstanding size of frame—one of the best framed lots I have ever handled. The wool was of 64's-60's type, and well stacked on (these ewes being particularly heavy cutters, having great belly covering) and was a very shafty wool generally.

Space will not permit of a detailed description of each flock, but the standard of the entries was very good, particularly of the first thirty in the table of awards.

AWARDS in Merino Ewe Championship.

	Type. (Max. 60 pts.)	Uniformity. (Max. 20 pts.)	Condition of Wool. (Max. 10 pts.)	Condition of Sheep. (Max. 10 pts.)	Total. (Max. 100 pts.)
A. S. Wright, Dubbo ...	57	18	8½	9½	93
G. Constance, Berridale ...	57	18	9	8	92
D. S. Bonnington, Curban ...	55	17	9	10	91
A. E. A. Hanckel, Munyabla	55	18	8	9	90
W. J. Cox, Mudgee	54	17½	9½	8½	89½
D. McKeon, Attunga ...	54	18	9	8	89
R. T. Maunder, Duri ...	54	16	10	8	88
L. F. Bennett, Nubba ...	53	17	9	8½	87½
F. C. Clark, Burrowa ...	54	16½	9	8	87½
A. Bush, Dalton	53	16½	8½	9	87
H. Carlon, Uralla	52	17½	8½	8	86
J. Cobley, Parkes	52	16	8	9	85
F. Lyons, Euchareena ...	52	16	8	8½	84½
C. H. Holland, Bidgeemia ...	51	16½	8	9	84½
L. G. Pearse, Quandialla ...	50	17	9	8	84
W. J. Coddington, Murrumburrah.	52	16	8	8	84
K. M. Beveridge, Harden ...	52	15	9	8	84
E. O. Hickey, Galong ...	51	16½	8½	8	84
W. Wetten, Burrumbuttock	51	16	8	8½	83½
R. C. Rowlands, Mandurama	51	16½	7½	8½	83½
R. Flannery, Galong... ...	51	16	8½	8	83½
M. T. C. Elliott, Goonumbla...	49	17	8	9½	83½
A. Tongue & Sons, Bowling Alley Point.	50	17½	7½	8½	83½
S. V. Rains, Birriwa	50	15	8½	9½	83
W. Russell, Grenfell ...	50	15½	8½	9	83
H. Mepham, Elsmore ...	51	16	8	8	83
F. Allen, Bibbenluke ...	51	15	8	8½	82½
L. Evans, Tumbarumba ...	49	16½	9	8	82½
L. A. O'Rourke, Tambar Springs.	51	16	7½	7½	82
A. Sleeman, Jerilderie ...	50	15	8½	8	81½
A. McAlister, Darlington Point.	52	13½	8	8	81½
A. P. Unger, Alectown ...	49	16	8	8½	81½
S. T. Starr, Quondong ...	49	15½	8½	8	81
H. W. Hobbs, Jindalee ...	50	16	7	8	81
J. Green, Weabonga ...	49	15½	8½	8	81
D. W. Burbury, Gilmore ...	48	16	8½	8	80½
R. Ellis, Walla Walla ...	48	16	8	8½	80½
L. W. Chick, Upper Manilla...	48	16	8½	8	80½
P. O'Mullane, Burren ...	49	15	8	8	80
R. Jackson, Singleton ...	48	16	8	8	80
A. Lang, Canyon Leigh ...	48	16	8	8	80
H. McDonald, Borenore ...	48	16	7½	8	79½
H. H. Bourne, Castlemount...	48	16	7½	8	79½
W. W. Armstrong, Wirrinya...	48	16	7½	8	79½
A. T. Coneley, Moss Vale ...	49	16	7½	7	79½
H. Coddington, Young ...	48	15½	7½	8	79
H. T. Scholz, Jindera ...	47	14½	8	9	78½
A. Martin, Woolamin ...	48	14	7	9	78
H. McDonald, Canowindra ...	46	15½	8	8	77½
R. R. Shephard, Fairholme...	46	16	8	7½	77½
A. A. Griffith, Clergate ...	47	14½	7½	8	77
W. B. Masters, Wellington ...	47	14½	7½	8	77
T. & P. Curran, Hartley ...	46	15½	8	7½	77

AWARDS in Merino Ewe Championship—*continued.*

—	Type. (Max. 60 pts.)	Uniformity. (Max. 20 pts.)	Condition of Wool. (Max. 10 pts.)	Condition of Sheep. (Max. 10 pts.)	Total. (Max. 100 pts.)
J. R. Sullivan, Binnaway ...	47	14	8	7½	76½
Freudenstein Bros., Tyagong	46	14½	7½	8	76
H. J. Moran, Bribbaree ...	46	14½	8	7	75½
K. Willis, Gunnedah... ...	47	14	7	7½	75½
M. A. Drew, Temora ...	46	14	7	8	75
J. T. Varcoe, Merriwagga ...	46	14	7	7½	74½
A. Craig, Junee	44	14½	8	8	74½
F. J. Benham, Willow Tree...	46	12	8	8	74
A. E. Tongue, Loomberah ...	47	13½	6½	7	74
L. O. Nash, Eugowra ...	45	13	8	7½	73½
R. Bradshaw, Berry Jerry ...	44	14½	7	8	73½
W. T. Wevan, Wee Waa ...	44	14	7	7	72
W. Whitechurch, Tubbul ...	43	13	7	8	71
W. A. Kneller, Narrabri ...	43	13	7	6	69
C. Butz, Batlow	42	11	7	7	67

General Comments.

The outstanding faults of the flocks generally were:—

1. The number of ewes showing the presence of hair, kemp, and heterotype fibre.

2. Ewes lacking in density.

3. The tendency of breeders to sacrifice frame, and to regard wool only when classing.

4. Using a type of sheep not suitable for the district.

5. Using rams which are not strong in the characteristics in which the ewes are weak.

Marked benefit was derived by breeders from the competitions. Even while the judging of the finalists was being conducted, many breeders expressed the opinion that, with the knowledge they had gained, they had a considerably better idea of what constituted a good sheep, and would be able to pick a better team next year. The weaknesses of each entry were pointed out, and the breeders will be able to introduce rams to rectify these faults.

When the competition is continued next year it is considered that it would be more helpful to the judges if it were conducted in zones or districts, the first and second flock in each district to be eligible for State honors.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
J. L. W. Barton, Wallerawang ...	20	1 Dec., 1932
Department of Education, Brush Farm, Eastwood ...	8	3 „ 1932
Wollongbar Experiment Farm, Lismore (Guernseys) ...	119	3 „ 1932
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	9	3 „ 1932
A. N. de Fraine, Happy Valley Dairy, Inverell ...	9	6 „ 1932
W. Pigg, Redlands Dairy, Inverell ...	33	6 „ 1932
Lunacy Department, Morisset Mental Hospital ...	27	7 „ 1932
W. W. Martin, "Narooma," Urana Road, Wagga ...	141	13 „ 1932
E. E. Winder, Wybong Road, Muswellbrook ...	46	14 „ 1932
J. F. Chaffey, Glen Innes (Ayrshires) ...	58	15 „ 1932
Newington State Hospital and Home ...	100	17 „ 1932
Lunacy Department, Callan Park Mental Hospital ...	31	20 „ 1932
Berry Experiment Farm ...	129	26 „ 1932
J. B. Burtenshaw, "Sunnyside," Inverell ...	36	27 „ 1932
Parker Bros., Hampton Court Dairy, Inverell ...	74	27 „ 1932
W. K. Frizell, Rosenstein Dairy, Inverell ...	44	28 „ 1932
W. T. Herbert, Racecourse Farm, Bega ...	40	7 Jan., 1933
C. J. Parbery, Allawah, Bega ...	108	8 „ 1933
J. Davies, Puen Buen, Scone (Jerseys) ...	147	14 „ 1933
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	80	22 „ 1933
New England Experiment Farm, Glen Innes (Ayrshires) ...	41	28 „ 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	21	28 „ 1933
Bathurst Experiment Farm (Jerseys) ...	31	1 Feb., 1933
New England Girls' Grammar School, Armidale ...	29	3 „ 1933
Lidcombe State Hospital and Home ...	149	3 „ 1933
G. L. Genge, "Easton," Armidale ...	33	4 „ 1933
A. B. Finney, Fox Ground, Gerringong ...	29	11 „ 1933
George Rose, Aylmerton ...	3	23 „ 1933
Riverina Welfare Farm, Yanco ...	89	24 „ 1933
Department of Education, Yanco Agricultural High School ...	39	24 „ 1933
Mittagong Farm Homes ...	36	24 „ 1933
Liverpool State Hospital, Liverpool ...	72	8 Mar., 1933
Miss Brennan, Arankamp, Bowral ...	17	8 „ 1933
G. W. Young, "Boorganna," via Wingham ...	41	10 „ 1933
Lunacy Department, Kenmore Mental Hospital ...	80	27 „ 1933
P. M. Burtenshaw, Killean, Inverell ...	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra ...	20	6 „ 1933
A. D. Frater, "Fairview Dairy," Inverell ...	51	6 „ 1933
A. H. Pye, Loch Levan, Inverell ...	47	7 „ 1933
W. Newcomb, "Minnamurra," Inverell ...	72	7 „ 1933
Rydalmere Mental Hospital ...	77	7 „ 1933
St. Joseph's Girls Orphanage, Kenmore ...	11	13 „ 1933
St. Joseph's Convent, Reynold-street, Goulburn ...	3	14 „ 1933
St. Michael's Novitiate, Goulburn ...	4	14 „ 1933
Marion Hill Convent of Mercy, Goulburn ...	47	15 „ 1933
G. A. Parish, Jerseyland, Berry ...	93	21 „ 1933
Australian Missionary College, Cooranbong ...	72	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra...	76	6 „ 1933
Koyong School, Moss Vale ...	3	11 „ 1933
Tudor House School, Moss Vale ...	21	13 „ 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	226	2 „ 1933
W. Hammond, Bellingen ...	77	16 „ 1933
Hurlstone Agricultural High School, Glenfield ...	44	22 „ 1933
E. C. Nicholson, Jillamatong, Corowa ...	180	23 „ 1933
St. John's College, Woodlawn, Lismore ...	47	23 „ 1933
Grafton Experiment Farm ...	271	14 July, 1933
P. Ubrihien, Corridgeree, Bega ...	123	15 „ 1933
William Thompson Masonic School, Baulkham Hills ...	37	20 „ 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 „ 1933
G. V. Ralston, "Porphyry," Seaham ...	98	21 „ 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook ...	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook ...	36	17 „ 1933
E. W. Flower, Binna Burra ...	56	18 „ 1933
E. P. Perry, Nundorah, Parkville (Guernseys) ...	30	25 „ 1933
Chapman Bros., Farm 166, Stoney Point, Leeton ...	43	25 „ 1933
Sacred Heart Convent, Bowral ...	10	26 „ 1933
Lunacy Department, Parramatta Mental Hospital ...	12	1 Sept., 1933
Department of Education, Gosford Farm Homes ...	38	2 „ 1933

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
James McCormack, Tumut	98	9 Sept., 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 „ 1933
G. Powell and Sons, "Loch Lomond," Armidale	22	26 „ 1933
R. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 „ 1933
C. Maynard, Holbrook	12	3 „ 1933
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 „ 1934
St. Patrick's College, Goulburn...	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 „ 1934
Wagga Experiment Farm (Jerseys)	53	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 „ 1934

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.

—MAX HENRY, Chief Veterinary Surgeon.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son, Carlingford	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson, Ermington ...	2,000	2,000	700	1,000	500	6,200
Swane Bros., Ermington ...	1,000	1,000	250	500	500	3,250
Geo. McKee, Ermington ...	1,000	2,000	...	...	...	3,000
C. Langbecker, Bundaberg, Queensland	...	750	...	...	250	1,000
F. Ferguson and Son, Hurstville	2,000	3,000	...	...	...	5,000
A. T. Eyles, Rydalmere ...	3,000	2,000	...	...	...	5,000
R. Hughes, Ermington ...	500	500	250	500	1,000	2,750

—C. G. SAVAGE, Director of Fruit Culture.

Some Notes on "Colic" in Horses.

C. J. SANDERSON, M.R.C.V.S., Senior Veterinary Surgeon.

DERANGEMENTS of the digestive organs in horses lead to and produce the symptoms of a disease known as "colic." In one form or another this is one of the commonest diseases of equines, and it is responsible for the loss of a large number of horses annually. Fortunately most cases are noticed in the earlier stages, and when treatment is administered promptly, a few hours generally restores the horse to health again, and no bad after effects are felt. Colic may be attributed to a variety of causes, but the symptoms exhibited are often similar. Such causes as parasites, calculi, strangulated hernia, intussusception of the bowel, etc., do not come within the scope of this article, and only the main points in connection with daily common causes, prevention and treatment will be mentioned.

Most derangements of the digestive organs are due to errors in diet, and a good and regular system of feeding will do more to prevent digestive disease than anything else that can be suggested.

The following rules for feeding are generally accepted as correct:—

1. Water before feeding, and not for at least an hour after.
2. Feed in small quantities, and often.
3. Do not work hard immediately after a full feed.
4. Never give a horse food to which it is not accustomed in large quantities.

If the above rules are followed, and care taken to ensure that only sound, good food is fed, very little trouble will be experienced.

Watering.

Horses require anything from 5 to 15 gallons of water a day, the quantity depending on the temperature and the amount of work performed. The water should be as pure as possible, clear in appearance, and free from taste, colour, or smell. Pure water is just as essential to a horse as it is to a man, and it is a mistake to suppose that a horse can drink badly contaminated water with impunity. Water obtained from pools or shallow wells contaminated with surface drainage, or containing decomposing organic matter, frequently causes diarrhœa, and generally predisposes to colic. Water that contains a large amount of sediment should not be given, as the sediment causes a mechanical irritation of the mucous membrane of the stomach and intestines—*i.e.*, sand colic. When at rest in the stable, water should be given three times a day, and should invariably be given previous to feeding.

This latter point is of considerable practical importance. A horse's stomach is small in proportion to the animal's size, and water does not remain in it, but passes through the stomach and small bowel to the caecum, or water-gut. If water is given after feeding, besides weakening the digestive juices, a considerable portion of the food in the stomach and small intestines will be washed out in an undigested state, and indigestion and colic

may result. Water in small quantities can be given within an hour or so from the completion of feeding, if desired. After a long journey, it is a good plan to water a mile or so before the journey's end, and take the horse slowly in afterwards. This prevents chills and colic due to the ingestion of a large quantity of water when in an exhausted state. An animal after prolonged exertion or fast work has its system depleted of fluid. It will not eat sufficiently until its thirst has been satisfied; therefore the water should come first, and while the animal is still warm is the best time to give it. After standing, the body temperature falls, and to give cold water freely then is only to intensify the effect of the cold water on the system.

Feeding.

A consideration of the anatomy and physiology of the horse's stomach will greatly assist in understanding the digestive derangements which produce colic. The stomach is a bag-like organ with two openings, one from the gullet and the other to the bowel, and, as already stated, it is remarkably small. It has powerful muscular coats for the purpose of kneading and churning the food, and it manufactures a digestive fluid called gastric juice in very large quantities. The capacity of the organ is from 25 to 30 pints, and digestion is most rapid when two-thirds full. In respect of this latter statement, it has been found that an excessively large feed will delay digestion for hours beyond the normal period. It is obvious that the small stomach of a horse necessitates that it must be constantly refilled in order to dispose of the large amount of food required by the animal. Food is not meant to stay long in the stomach or first portion of the intestines, and in the three or four days which it takes to go from the mouth to the anus all but a few hours is spent in the large bowels at the end of the intestinal tract. Food should be digested and passed out quickly, and anything which causes retention of food in the stomach is liable to produce colic. To ensure rapidity of stomach digestion, it is essential that the food shall arrive in that organ in a properly prepared state. It must be thoroughly masticated and well mixed with saliva, and the better masticated the more easily it is digested in the stomach.

Good Teeth are Essential to Thorough Mastication.

For perfect mastication the teeth must be in good order. Frequently in young animals mastication is imperfectly performed, due to faulty shedding of the first teeth; while in older animals, the edges of the teeth became so long and sharp that mastication becomes almost impossible. Horses so affected will bolt their food without proper crushing, and this, of itself, frequently causes colic through fermentation in the stomach. Teeth should be examined occasionally, and treated if necessary, as, apart from colic, faulty teeth are responsible for a great loss of condition.

If small balls of partly chewed food are found in the manger, watch the horse eating, when it will probably be found that he gives two or three rapid

movements of the jaws, and drops the food from the mouth. This process is known as "quidding," and indicates that the teeth are badly in need of attention.

While on the subject of proper mastication, horses whose teeth are in good order frequently bolt their food from habit. This should be prevented by mixing chaff or dry bran with the grain, and by placing several large stones in the manger to prevent bolters from securing too big mouthfuls at a time.

Another cause of bolting is the practice of giving boiled food. This is not only unnecessary, but often distinctly harmful. Boiling does not increase the digestibility of food, but permits of bolting without mastication, and sudden overloading of the stomach. Further, boiled food, if not given directly it has been prepared, is apt to undergo fermentation. Linseed is the only food that requires boiling before use.

Should a horse's stomach become overloaded he cannot relieve it by vomiting, as, owing to the anatomical arrangement, vomiting is impossible. To this danger must be added the further one that the pressure of food in an overloaded stomach may cause the opening into the small bowel to become closed also. When this takes place, food is imprisoned in the stomach, and after a short time ferments, and ultimately, owing to the stretching of its walls, the stomach becomes paralysed. Cases of this sort frequently occur, and rupture of the stomach is not an uncommon sequel.

Small Feeds at Frequent Intervals.

The practical means of avoiding this and other stomach troubles is to give small feeds at frequent intervals, and to be especially careful with exhausted horses, mares in foal, young stock just being broken-in, and animals in poor condition. In the case of the latter two, the involuntary muscles of the bowels are in just as soft condition as the external muscular system, and are not capable of dealing with large quantities of food at a time.

Perhaps the commonest cause of colic is giving horses food to which they are not accustomed. A sound physiological reason exists for not doing this. It has been proved that the character of the food influences the quantity and quality of the gastric and pancreatic juices. A definite and constant diet produces juices capable of digesting it, but utterly incapable of dealing with sudden changes of food. Under proper conditions, no food will cause colic, although some (as for example, wheat and barley) are more indigestible than others; but many foods will do so if given in excess, or at the wrong time, such as giving lucerne to a horse that has been starved for a time. Horses can be made to exist on practically any food that is digestible, provided they are gradually accustomed to it; but to give a horse a full feed of, say, maize, if he has never had the grain before, is to invite digestive troubles that may cause death. Again, grass-fed horses suddenly put on to dry feed on being taken on a long journey get colic, owing to the sudden change of food.

If you wish to avoid colic, give food at regular intervals, and see that the food is of good quality and of proved dietetic value. Mouldy corn, damaged oats, or musty hay very often produce colic, while proprietary foods of unknown composition, and frequently of doubtful feeding value also, often do a great deal of harm. Do not give green forage in an immature, fermented, or over-ripe condition.

Bran mixed with maize is a favourite food, but it is much too laxative for a horse in work, and is a frequent cause of an attack of colic.

Do not give large quantities of bran to a working horse. Bran is a good food to maintain the contents of the bowels in a soft condition, and to keep them acting, especially during periods of rest; but its nutritive value is practically nil owing to all the flour being extracted from it.

Do not suddenly alter the amount of food given. It is a common practice to have horses fed up for a day or two prior to severe work, and this causes much intestinal trouble, such as stomach staggers.

Never forget that young horses cannot digest as much corn as old ones. Horses when rested, even for a day or two, should have their food, especially corn, reduced. Failure to do this is the cause of much colic.

Another common cause of repeated slight attacks of colic, especially with working horses on farms, is the dry, rough, coarse, and indigestible nature of the herbage found in many paddocks. Too much coarse food prevents digestion by reason of its irritative effect on the stomach. A certain amount of bulky fodder increases the digestibility of the more concentrated foods, such as oats, but too great a quantity of such food greatly weakens the power to digest. A good example of the results of this is seen in so-called "wild melon poisoning." The horse's stomach is not adapted for the digestion of coarse food, and any coarse food that it eats is digested in the large intestines. Farm-horses, as a rule, eat far too much rough bulky fodder, and many suffer in consequence. A working farm-horse does not require more than 12 lb. of hay a day, and the rest of the ration should be made up of grain, such as oats, or half oats and maize.

Watch for symptoms of indigestion, such as an offensive smell in the mouth, and the presence of undigested oats or other food particles in the fæces. The condition of the skin is a good aid to detecting commencing digestive trouble; for example, the sudden swellings of nettle rash, and the irritation, and often eruption, shown by horses too highly fed. Such observation will often prevent colic, as the necessary measures (such as reducing the quantity of food given) can be adopted. A factor that cannot be overlooked in the causes contributing to colic is the way young stock are starved during periods of drought. Every farmer must realise how such periods of poverty must weaken every organ of the body, especially the digestive organs, and this weakened condition frequently results in attacks of colic when the horse is subject to the strain of work.

The Relation of Work to Colic.

Major-General F. Smith, of the Army Veterinary Department, in his work on Veterinary Physiology, makes the following statement:—"Apart from obvious explanations, as errors in feeding, the most common cause of digestive derangement is work. It is this which accounts for the majority of colic cases occuring towards the end of the day, the frequency with which the seizure occurs at or shortly after work, especially that of an exhausting nature, and the practical absence of colic among non-working horses." Every practical man knows this statement to be correct, and it is quite recognised that work interferes with normal digestion. Feeding in relation to work is a big subject, but the following points should be noted:—Regularity of feeding and regular, but not excessive, work, are great factors in preventing digestive diseases. Personally, I am strongly of opinion that the length of time a horse works without resting or feeding has more to do with colic induced by work than any other cause. Do not work a horse more than two or three hours at a time without giving him a short rest, especially if the work be severe, and the rest should be without harness. A few mouthfuls of water and food during these short rests is good also.

As already pointed out, horses must not be worked on a full stomach. A fall in draught, or even a bad stumble, may, on a full stomach, cause rupture of the diaphragm (midriff) or rupture of the stomach itself.

To sum up, see that a horse does not start work on a full stomach, and do not give big feeds of any sort, but more especially bulky food, during work. Small feeds on the road, and the main bulk of the food, especially hay, after work, is the best rule; but even then, do not give feed too soon after a hard day's work—wait till rest has restored the animal's digestive powers to the normal.

Symptoms and Treatment of Colic.

It is extremely difficult to differentiate between the various gastric and intestinal affections in the horse, and most complaints seem to be placed under the head of colic. The name is given to a train of symptoms which horses show when they have pain in the abdomen. In the horse we distinguish two forms of colic, viz., spasmodic and flatulent.

Spasmodic Colic.—The pain is not continous, but there are intervals of ease between the spasms, during which the animal appears quite well, until another spasm suddenly occurs. The animal is generally violent, paws, stamps, kicks at its belly, lies or throws itself down, rolls, crouches in the loins, when walking stretches itself out as if trying to urinate, looks round at the sides, and sweats either in patches or all over. The pulse is fast, the breathing hurried and distressed, and the mucous membrane of the eye is red, but the temperature remains normal. Between spasms the animal appears quite well, and will start feeding if allowed. As the attack progresses, the pains get more frequent and longer, and the intervals free from pain shorter.

The bowels are constipated as a rule, and if the animal passes any dung, it is only a very small quantity.

Treatment.—Walk the animal about, and on no account permit it to lie down or roll. Give the following drench at once:—

Oil of peppermint, 1 drachm.
Aromatic spirits of ammonia, 2 ounces.
Linseed oil, 1 pint.

Keep well shaken, and drench slowly.

If relief is not obtained in an hour, repeat the mixture, substituting thin gruel for the linseed oil. This may be repeated till three doses have been given, at intervals of an hour. Apply hot fomentations to the abdomen for periods of half an hour at a time, keeping the temperature of the water so high that the hand cannot be kept in it—half cold fomentations are quite useless—or mustard mixed sloppy in a basin with vinegar may be rubbed over the belly. Give copious enemas every hour. If, in spite of this treatment, the animal is still not relieved, give the following drench, repeating if necessary every three hours:—

Chloral hydrate, 1 ounce.
Thin gruel, 1 pint.

Flatulent Colic.—This is due to fermentation of the food in the bowels, which become distended by the resultant gases. The belly is inflated, giving the animal an unnaturally round appearance, and the pain is continuous, though not so violent as in the spasmodic variety. The animal does not throw itself about so much, but appears somewhat sleepy, though uneasy and fidgety, scraping, wandering slowly round, attempting to lie down, but afraid to do so.

Treatment.—Give the following drench at once:—

Oil of turpentine, 2 ounces.
Aromatic spirits of ammonia, 2 ounces.
Linseed oil, 1½ pints.

Shake the drench very frequently whilst giving.

Walk the animal about and give enemas and fomentations as in spasmodic colic.

If the pain is not relieved in two hours, give an ounce of oil of turpentine in a pint of thin gruel, and repeat again in two hours if necessary. If still not relieved, give the choral hydrate as in spasmodic colic. Relief is indicated by the free passage of wind and fæces.

As an after treatment, when the pain has subsided, feed the animal on bran mashes for twenty-four hours. It is also best not to work the horse for two or three days.

In drenching, if the animal struggles, or attempts to cough, immediately lower the head. A portion of the drench may be wasted, but unless this is done the fluid will be likely to pass down the windpipe, and the horse die of pneumonia.

Some Home Remedies.

A liberal supply of rock salt or some reliable salt lick is a great aid to digestion. In outlying places, where it is not always possible to obtain

the necessary drugs at short notice, it is advisable to keep on hand a few well encapsuled ½ ounce balls of carbonate of ammonia, and administer on the first signs of approaching attacks (but very great care must be taken that the outer covering is not broken during administration). Failing this, such remedies as the following can usually be obtained as a means to first aid:—

1. *Baking Soda*—Give 2 oz. (4 tablespoonfuls) in a pint of water.
2. *Powdered Ginger*—Give 2 tablespoonfuls in a pint of warm water.
3. *Ground Black Pepper*—Give 1 tablespoonful, shaken up, in a cupful of oil.
4. *Turpentine*—Give 2 oz. (4 tablespoonfuls) in a pint of linseed oil. Shake well when drenching. If linseed oil is not available, the turpentine can be given well shaken in a quart of milk.
5. *Powdered Charcoal* in any quantity is useful in flatulent colic. This can be given in thin gruel.
6. *Whisky*, in half-pint doses, well diluted with water, combined with two tablespoonfuls of powdered ginger, yields good results.

Of the remedies mentioned, Nos. 1, 2, 3, 5, and 6 can be repeated, if necessary, several times, at intervals of an hour. No. 4 can be repeated once after four hours' interval, substituting thin gruel for linseed oil.

Rectal injections of warm, soapy water, given with a large syringe through a piece of rubber hose pipe 4 to 5 feet long, is good treatment. Six quarts should be given at a time, and repeated in an hour if required. The end of the pipe should be smooth, and it should be oiled before being introduced into the bowel. The whole length of the pipe should, if possible, be inserted, but no force must be employed to do this.

In flatulent colic, tobacco water is sometimes used as an enema with advantage. To make this, take 8 to 10 inches of twist tobacco, put into a quart of boiling water, strain, and when about the heat of freshly-drawn milk give as an enema. The instructions already given as to applying hot water fomentations, applying mustard to the abdomen and keeping the horse moving about, should also be carefully followed.

Infectious Diseases Reported in October.

The following outbreaks of the more important infectious diseases were reported during the month of October, 1932:—

Anthrax	1
Blackleg	7
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	3
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	Nil.

—Max Henry, Chief Veterinary Surgeon.

Dairying Notes.

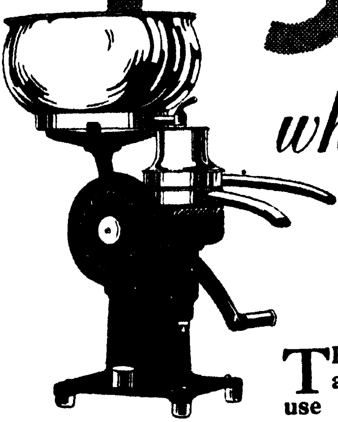
A Vital Principle in Dairy Management.

IF dairying is to be profitable the herd must be fed and managed with a proper appreciation of the milking cow's needs. Cows in heavy milk and fed on normal rations in quantities sufficient to maintain live weight invariably lose calcium from the skeleton during the first half of the period of lactation, in spite of adequate amounts of calcium in the ration. Even the feeding of large amounts of calcium in the ration in the form of bonemeal, calcium carbonate, etc., does not affect the position—the heavy milker still loses calcium from her bones. Experimental work carried out at the State College, Pennsylvania, U.S.A., shows that in the selective improvement of the milch cow we encounter limitations of capacity to assimilate minerals, especially calcium. A complete study of the subject showed that the minerals in the skeleton were more readily available for use in milk production than the calcium compounds fed in the ration. The explanation of this is that parturition lets loose a pent up flood of nutriment which has been stored for the use of the calf. This outpouring of mineral-rich food proceeds in large measure independently of the food supply; that is, if the food is just sufficient to maintain the life of the cow she will produce milk even though this involves extensive removals from the tissues of the body. This giving out more than is taken in cannot go on indefinitely, and at some point between the middle and end of the period of milking, when the impulse to secrete milk has spent itself, the milk production comes to be definitely related to and dependent on the feed intake, and falls off in amount to such an extent that a fresh storing up of calcium in the skeleton becomes necessary. It is the duty of all cattle owners to see that the cow gets a chance to store up minerals against the time when the birth of another calf will once more require her to draw on her skeleton for a fresh supply in excess of what she can take in.

It is obvious, therefore, that a cow should have a dry period of sufficient length, and feed during that time to permit the entire replacement of the minerals given out. Dry off in good time and feed well if you want good results.

As an example of the urgent necessity of giving the cow an opportunity of storing up lime and protein, the analyses of colostrum and ordinary milk may be quoted.

	Colostrum.		Ordinary Milk.	
		per cent.		per cent.
Water		74·7		87·3
Casein	3·3	17·6	3·0	3·8
Albumen	14·3		·8	
Fat		3·6		3·6
Sugar		2·6		4·6
Mineral matter		1·5		·7



From this it is clear that colostrum milk is much higher in protein and mineral matter than the ordinary milk. This is nature's provision for the rapidly-growing body of the calf—to provide the large amount of protein or flesh-building material and the mineral matter or bone-building material. The farmers—and there are many of them—who depend on the natural pasture in winter to feed the in-calf cow, do not give her a chance to prepare for the next season's milking. She calves in poor condition with little reserves; consequently, her calf is weak, her production smaller than it should be, and her period of payable production is considerably shortened. If the farmer continues to follow this course season after season he will ruin the cow as a milker, and the effects of his errors will be felt by the cow's progeny.

Cleansing of Dairy Utensils.

Of the various sources of milk contamination the unclean utensil is by far the most prolific, despite the fact that it is also the most easy to control. Sufficient thoroughly hot water and a certain amount of system are the main requisites in reducing trouble under this heading—plus of course, an appreciation (by no means general) of just what is implied by the word "clean."

Three processes are properly involved in the cleansing of dairy utensils, namely:—

1. Thorough washing to remove all traces of milk.

2. Treatment of the washed surface (with steam, some chemical preparation, or boiling water) to destroy as many as possible of the bacteria remaining.

3. Thorough drying (except where the utensils are to be used immediately) to prevent the multiplication of the few highly resistant organisms that still survive.

There is no substitute for a thorough washing, which should be given as soon as possible after the utensil is emptied, before the film of milk on the metal surface has a chance to dry. This milk should be removed by rinsing with luke-warm water; if the water for this first rinsing is hot the milk is scalded on the metal, making it very difficult to remove. The utensils should then be scrubbed thoroughly with a brush, using hot water containing washing soda or other cleanser. A small washing vat, considerably simplifying the operation, should be a feature of every dairy farm.

For the second of the above-mentioned processes the most effective agent is steam under pressure, but its use is scarcely practicable on the farm. Certain chemical preparations can be recommended to the farmer careful enough to use them strictly according to direction, and who can be depended upon especially to make sure that the preliminary cleansing has been thorough; but as a standard method of sterilisation there is much to be said for the use of boiling water, so long as it *is* boiling and there is an adequate supply. Hot water poured around the sides of a can rapidly cools

to a point at which it is no longer effective in destroying bacteria, and the smaller the quantity used the more rapid the cooling. Experiments have shown that for an 8-gallon can at least a quart of actually boiling water is required to sterilise it effectively.

The scalding of pails, strainers, etc., is very simple, and if sufficient boiling water is used and all the inner surface is treated, large numbers of bacteria are destroyed. In the case of cans, in addition to pouring the boiling water around the sides, it is advisable to replace the lid, and then roll the can along the floor on its side for three or four complete revolutions, to make sure that every inch of the inner surface is treated. The lid may be treated by inverting the can for a moment before the water is emptied out.

Complete immersion for a minute or two in a tank of boiling water is, of course, the ideal way of scalding dairy utensils.

The Importance of Quick Drying.

Articles scalded by either of the above methods will not take long to dry if they are immediately inverted and placed in a rack in a sheltered position in the sun. This quick drying is not the least important of the three processes of cleansing, experiments showing, states a Canadian departmental publication, that cans which were washed, but not scalded, and placed on an outdoor draining rack contaminated the milk less than cans which were washed, thoroughly scalded, drained, and then stood indoors with the lids on. The unscalded cans at first contained many more bacteria, but the rapid drying of the cans prevented these from multiplying, so that at the end of five hours the descendants of the few bacteria surviving in the scalded but undried cans outnumbered them. Had the cans been held for a longer period the advantage would have been much more strongly in favour of the dried cans.

It might be objected that to expose utensils on an outdoor rack is to invite contamination from dust. The dairyman's aim should certainly be to keep his milk as free as possible from dust and the bacteria it contains, but the bacteria so deposited would not compare in number with those which develop in a moist can. Should, however, there be serious trouble from this cause the utensils should be rinsed with boiling water immediately before use.

On no account should a cloth be used for the drying of utensils. Even the cleanest cloth largely cancels the benefits of scalding.

Commonwealth Bank Assists Dairy Herd Recording.

The Minister for Agriculture (Hon. Hugh Main, M.L.A.) has announced that the Board of Directors of the Commonwealth Bank have favourably considered the question of subsidising the herd-recording scheme for the current season, and have advised that they are prepared to contribute the sum of £1,000 from the Rural Credits Development Fund, plus a further 9d. per head per annum for every cow recorded in excess of 15,000.

Prevention of Food Flavours in Cream.

A number of plants are detrimental on account of their effect on the flavour of cream, but most food flavours are volatile and can be eliminated or greatly reduced by pasteurisation and aeration at the factory, while aeration over the ordinary farm cooler also assists in this respect. Such weeds as carrot weed, cape weed, dandelion, and certain others, however, are strong milk tainters at certain stages of their growth, and the ordinary treatment at the factory may not remove taints of this nature. Where pastures contain strong tainting weeds, efforts should be made to keep the cows off such pastures for at least three hours before milking, if possible, while the cream should be aerated over the ordinary farm cooler as it leaves the separator.

Fortunately the weeds directly detrimental to the dairy farmer as productive of undesirable cream flavours are comparatively few, but there are many plants which are undesirable on cultivation land or in a pasture, and it is advisable to have a knowledge of their appearance and to be continually on the lookout for them. In the departmental pamphlet "Weeds on the Farm" are pictured twenty-five of the worst weeds of New South Wales. This publication, which contains also recommendations for their control and that of weeds generally, is obtainable free on application to the Department.

Reorganisation of the Cheese Industry in Canada.

Official reports from Canada state that comprehensive plans revolving around the manufacture of cheese in Ontario and its subsequent marketing are designed to put the dairy industry in the province on a much more stable basis than at present. The project, which has the endorsement of the entire provincial cabinet, has been under consideration by the Department of Agriculture and the Ontario Marketing Board for fully a year, and involves the amalgamation and consolidation, over a period of years, of the numerous cheese factories throughout the province, together with the establishment of cold storage plants at convenient points.

Under the plan, cheese factories in Ontario would be reduced from the present total of 774 to approximately 150, by a process of amalgamation and elimination. Some twenty new storage plants would be created as a means of facilitating grading and building up export markets. The Government of Ontario undertakes to further matters by aiding the farmers in every way possible in increasing production. A tentative period of five years has been set for the full working out of the project, provided the full co-operation of those interested is obtained. Legislation in some form, it is stated, will be brought down at the next session of the legislature to give the Government certain powers for the furtherance of the scheme.

Briefly outlined, the plan is intended to place the manufacture and sale of cheese and butter on a huge co-operative basis, reduce the overhead by the elimination of small cheese factories, increase the volume of milk production, create central storage houses, and build up a selling organisation.

Control of the Cattle Tick.

Arrangements have now been completed to carry out inspection for cattle tick on many properties outside the tick quarantine areas to which cattle had been moved from the areas found infested in the Clarence Valley early in this year. These inspections will have to be repeated several times during the coming summer and autumn. It is asked that stock-owners will furnish every facility to enable this work to be carried out, as in the interests of the cattle industry, both beef and dairying, it is of the utmost importance to endeavour to determine whether there has been any further spread of cattle tick. Any person finding ticks on cattle or horses outside the quarantine areas is requested to send them to the Chief Veterinary Surgeon of the Department of Agriculture in order that they may be identified, or give them to the local Inspector of Stock.

Several species will attach themselves to cattle, and most are comparatively harmless. Persons finding ticks of any sort on cattle or horses in the quarantine areas should advise the nearest inspector. It would be very regrettable if a false feeling of security were created because so far no further extension of tick has been found. It cannot be too strongly emphasised that for the next nine months everyone working with cattle should be on the look-out for tick. Close inspections are now being carried out in the Macksville and Dorrigo sections of the Coff's Harbour Quarantine Area in an endeavour to determine whether those sections are free from cattle tick.

To the Newcomer to Dairying.

A striking development as the result of changed economic conditions has been the tendency to add dairying to wheat production and other regular branches of farming. There is much to be said for diversification, and where the fundamental requirements of successful dairying are observed the newcomers to the industry will find it a useful supplementary source of income. It must be emphasised, however, that slipshod methods are neither to the advantage of the individual farmer nor of the industry as a whole.

Quality is the basis of profitable dairying, and in order that only first-class and hygienically produced milk products shall be marketed commercially, dairying is governed by certain laws. Every dairyman *producing* milk or cream for sale is required to register his premises under the Dairies Supervision Act, while if he *manufactures* dairy produce, such as butter or cheese, for sale his operations are controlled also by the Dairy Industry Act. Full details of the procedure necessary for those embarking in the industry may be obtained from the Dairy Branch of the Department of Agriculture, Box 36A, G.P.O., Sydney. The requirements under the Dairies Supervision Act are discussed in detail in the "Dairy Manual," which contains also plans for the construction of dairy buildings. This publication, which may be described as a necessity for every commercial dairy farmer, is obtainable from the Department, price 1s. 1d. (postage included).

Aids in Establishing the Identity of Johnson Grass and Sudan Grass.

D. O. CROSS, B.Sc.Agr., H.D.A., Assistant Botanist, Botanic Gardens, Sydney.

INQUIRIES that are received from time to time as to how to distinguish certain rather closely-related grasses and other plants frequently involve a rather detailed and specialised botanical investigation, but on its completion an

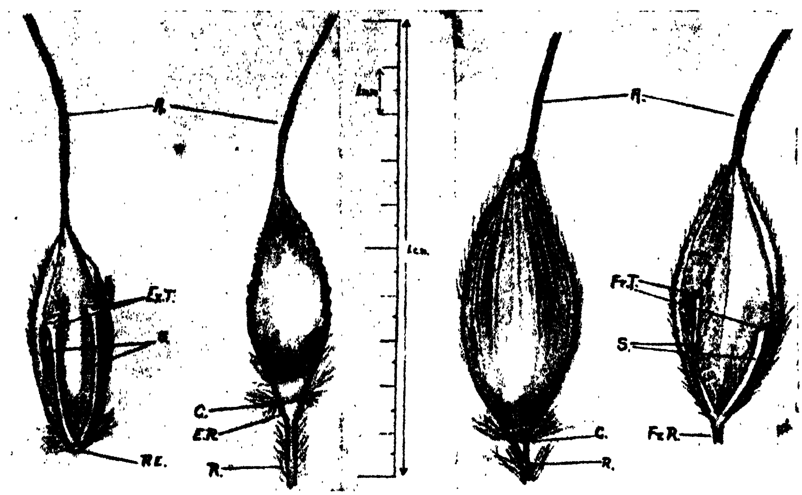


Fig. 1.—Spikelets of Johnson and Sudan Grasses.

On the left.—Johnson Grass (*a*. back of spikelet; *b*. front of spikelet).

A.—Awn.

Ex.T.—Expanded tips; showing how the pedicelled (stalked) spikelet and the sessile (stalkless) spikelet next above on the rachis, break away clean without fracturing the stalks or raches.

S.—Small stalks or raches.

R.E.—Rounded end of spikelet; showing scar where it has broken away from the rachis.

C.—Constriction—between the rachis and the base of the spikelet.

E.R.—Expanded tips of the rachis or stalk—not so apparent in Sudan grass.

R. Rachis or stalk.

On the right.—Sudan Grass (*c*. front of spikelet; *d*. back of spikelet).

A.—Awn.

C.—Constriction—between the rachis and the base of the spikelet.

Fr.R.—Fractured end of the rachis—remaining attached to the spikelet.

Fr.T.—Fractured tip of the small stalks.

R.—Rachis or stalk.

S.—Small stalks or raches.

NOTE.—The sketches have been drawn with the aid of the camera lucida and for convenience the millimetre scale is shown enlarged under the same magnification. (¼ inch equals approximately 6 mm.).

endeavour is made to pick out points which will hold throughout the average variation found in the specimens, and be of practical usefulness to the non-botanist requiring them.

A request that is frequently made is how to distinguish Johnson grass from Sudan grass in specimens of the seed head and leaves only. Both these grasses belong to the same genus, namely, *Sorghum*, but they are different species, *i.e.*, Johnson grass is *Sorghum halepense* Pers. and Sudan grass is *Sorghum sudanense* Stapf. The main point of difference in the separation

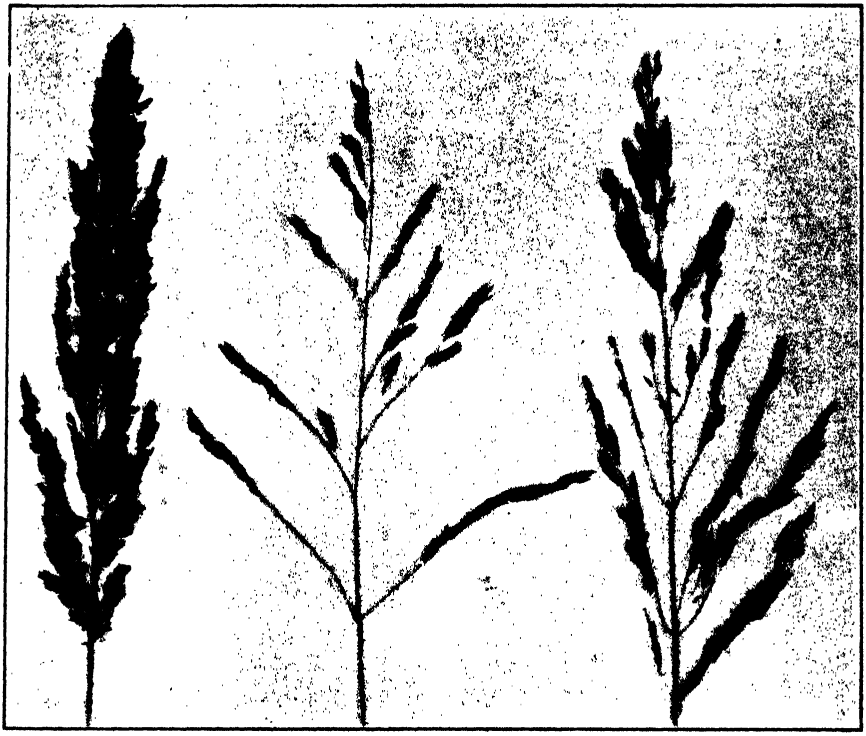


Fig. 2.—Heads of Johnson and Sudan Grasses.
Left.—Johnson Grass. *Centre and Right.*—Sudan Grass.

of these two species is the perennial habit with creeping underground rhizomes (stems) of Johnson grass, as opposed to the annual habit and absence of underground rhizomes of Sudan grass. Apart from this, the two grasses are very similar, and do not differ very strongly in any botanical features, while the variation found in each brings the seed heads and other characters of the grasses into even closer approximation, especially in certain forms.

A perusal of the descriptions of these plants, together with an examination of a number of specimens, has brought out the points which are shown below in tabular form. While they are found to be fairly constant, however, it must be understood that they are only intended as helpful practical characters from the non-botanist's point of view.

Johnson Grass (*Sorghum halepense*).

Habit.—Perennial.

Underground Portion.—Creeping stems or rhizomes.

Leaves.—The average longer than Sudan grass; the largest 24 inches and over. Usually wider than Sudan grass; the widest over ¾ inch wide.

Panicle.—Frequently longer, narrower, and more compacted and appressed to the central rachis than Sudan grass, ranging from about 5 to 16 inches long. Lower branches more often under 6 inches long, the average ranging from about 2 to 5 inches. (See Fig. 2.)

Number of Spikelets ("*seeds*").—Usually much crowded in the panicle. Numbers of spikelets on the branches from the base upwards range generally somewhat as follows:—

Basal	branches	each	50	to over	65
2nd	,,	,,	20	,,	60
3rd	,,	,,	15	,,	50
4th	,,	,,	12	,,	40
5th	,,	,,	10	,,	30
6th	,,	,,	10	,,	20
7th	,,	,,	5	,,	15

Others mostly 5 or under.

* *Size of Spikelets.*—Usually smaller than in Sudan grass—about 4 to 5 m.m. long.

Colour of Spikelets.—A predominance of purple to reddish-black spikelets.

* *Base of Spikelet.*—A definite slight swelling at the top of the rachis (stalk), and a constriction or groove where it joins the base of the spikelet. (See Fig. 1*b*.)

* *Detached Spikelets.*—Spikelets usually break away from the rachis clean, leaving the rounded base of the spikelet and a slightly expanded tip to the rachis (stalk). (See Fig. 1*a*.)

* *Small "Stalks."*—The one or two small "stalks" attached to the back of the spikelet are usually intact, with slightly expanded tips. (See Fig. 1*a*.)

Sudan Grass (*Sorghum sudanense*).

Habit.—Annual.

Underground Portion.—No creeping underground rhizomes.

Leaves.—The average usually shorter than Johnson grass; the longest in majority of cases not exceeding about 18 inches. Usually narrower than Johnson grass; the average not much exceeding ½ inch wide.

Panicle.—Usually shorter, more pyramidal and generally more loose, with branches tending to be arranged more at right angles to the central rachis, and wider, especially at the base, ranging from about 6 to 12 inches long. Lower branches often over 6 inches long. (See Fig. 2.)

Number of Spikelets ("*seeds*").—Usually rather sparsely arranged. Numbers of spikelets on the branches from the base upwards range generally somewhat as follows:—

Basal	branches	each	20	to over	50
2nd	,,	,,	10	,,	40
3rd	,,	,,	10	,,	20
4th	,,	,,	5	,,	20
5th	,,	,,	5	,,	15
6th	,,	,,	5	,,	10
7th	,,	,,	1	,,	8

Others mostly under 5.

* *Size of Spikelets.*—Usually larger than Johnson grass—about 6 to 7 m.m. long.

Colour of Spikelets.—A predominance of lighter straw- to orange-coloured spikelets.

* *Base of Spikelet.*—No very definite swelling at the top of the rachis (stalk), and no well-marked constriction between rachis and base of spikelet. The rachis or stalk rather appears to merge gradually into the base of the spikelet. (See Fig. 1c.)

* *Detached Spikelets.*—Spikelets more often break away with a portion of the rachis (stalk) attached, this latter exhibiting a fractured end on the spikelet. When the spikelets appear to have broken away clean, examination with a lense will often show a small fractured rim of the rachis at the base of the spikelet. (See Fig. 1*d*.)

* *Small "Stalks."*—The one or two small "stalks" attached to the back of the spikelet are usually broken off about half their length, exhibiting fractured ends. (See Fig. 1*d*.)

* **These are the most useful points of distinction; the other points can only be regarded as helpful if correlated with the spikelet characters.**

If, after applying these tests, difficulty is still found in establishing the identity of either of these grasses, it would be advisable to forward the specimens, as complete as possible, to the Director, Botanic Gardens, for identification.

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IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1932:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ...	451,255	51,874
Tomatoes ...	149,390	3,431
Bananas	30,401	28,177
	bunches.	
,, ...	51	...
	cases.	
Pines	47,217	890
	trays.	
Strawberries ...	17,082	...
	lb.	
Canned Fruit ..	235,172	...
Dried Fruits—		
Unspecified ...	10,080	...
Currants ...	5,880	...
Raisins ...	2,940	...
Apricots ...	364	...
Apples ...	616	...
Peaches ...	812	...
Pears	224	...
Prunes ...	336	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	1,779
Bananas ...	....	6,069	...
Lemons ...	....	...	3,063
Oranges ..	....	5	39,506
Grape Fruit ...	....	...	276
Pears	....	...	110
Pineapples ...	....	...	2,958
Other	....	137	15,660
Dried Fruits—		lb.	lb.
Apples ...	....	...	1,360
Apricots ...	....	...	1,602
Currants ..	....	...	21,920
Peaches ...	....	...	364
Prunes ...	United States ...	245,760	5,250
Figs	Turkey	2,670	...
Raisins—			
Sultanas ..	....	...	128,302
Lexias ...	....	...	392
Other ...	....	...	5,660
Dates	Iraq	333,495	13,759
Other	China	2,980	...
	Japan	14	2,148
Preserved in liquid—			
Apricots ...	....	...	252,525
Peaches ...	....	...	498,767
Pears ...	....	...	59,463
Pineapples ...	....	...	1,552
		Gallons.	
Other ...	....	61	60,197

The Disposal of Waste Fruit.

New Designs for Covered Pits.

A few years ago Mr. T. McCarthy, Senior Assistant Entomologist, conceived the idea of disposing of waste and insect-infested fruit in a pit covered with an insect-proof framework so that the adult insects emerging from the dumped fruit are imprisoned and eventually die.

As the result of several years' experience this method of destroying waste fruit is now recommended in preference to burning or boiling, but the design of the pit cover has been simplified as compared with that suggested in 1929. The present article describes two types of cover which can easily be constructed by orchardists.

The destruction of all waste fruit and of all fruit infested with codling moth or fruit fly is obviously a useful method of control of the two pests mentioned, and should be systematically carried out by every grower. In fact, regulations under the Plant Diseases Act require the destruction of all such fruit by either burning or boiling, or by disposal in a pit with an insect-proof cover. Unless the burning or the boiling of the fruit is thoroughly carried out, it is not likely that all the maggots will be destroyed, and for this reason the adoption of the pit method is especially to be recommended. In some areas firewood is difficult to obtain, but even where firewood is obtainable, one or more of these pits in suitable positions in or against the orchard form a convenient and economical means of dealing with this problem, always provided the top of the pit is so constructed that adult insects do not escape to reinfest the orchard.

The purpose of this article is to describe and illustrate two types of pit cover considered suitable, and of these, that shown in Fig. 1 is recommended for preference, as it can be much more easily moved to a fresh location in the orchard if required.

A Movable Pit Cover.

The type of pit cover shown in Fig. 1 consists (see A and B) of a 3-inch by 2-inch hardwood framework 7 feet 2 inches by 6 feet wide (outside measurement). These measurements permit of the framework being completely covered (see C) with sheets of plain 26-gauge galvanised iron 6 feet long by 2 feet 6 inches wide, overlapping 2 inches at the junctions. The iron should be carefully nailed to the woodwork so as to leave no openings through which the flies may escape.

In the centre of the framework an opening is left through which the fruit is dumped. A flange of wood 4 inches wide by 1 inch thick is fixed inside this opening, projecting 2 inches above the cover to allow of a lid (as shown in B) being put tightly over the flange, as shown in C. The lid is made of 1-inch T and G wood closely fitted together. In one corner of the framework is an opening covered with fly-proof gauze and protected with

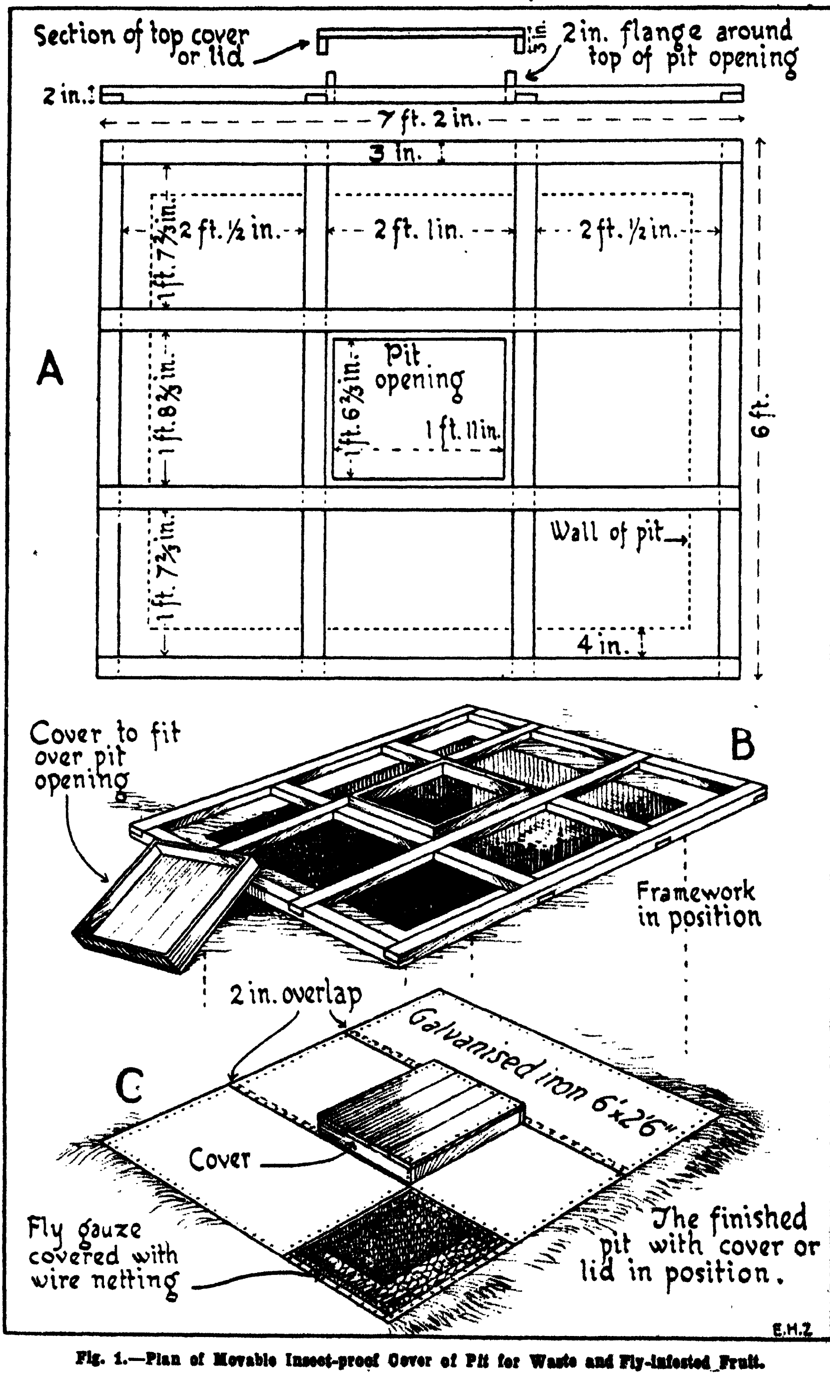

Fig. 1.—Plan of Movable Insect-proof Cover of Pit for Waste and Fly-infested Fruit.

wire netting (see C). This permits the light to attract the flies away from the centre opening and considerably lessens the chance of flies escaping when fruit is being dumped.

The soil should be banked up to the edges of the cover, and the latter when placed in position should extend 6 inches beyond the edges of the pit.

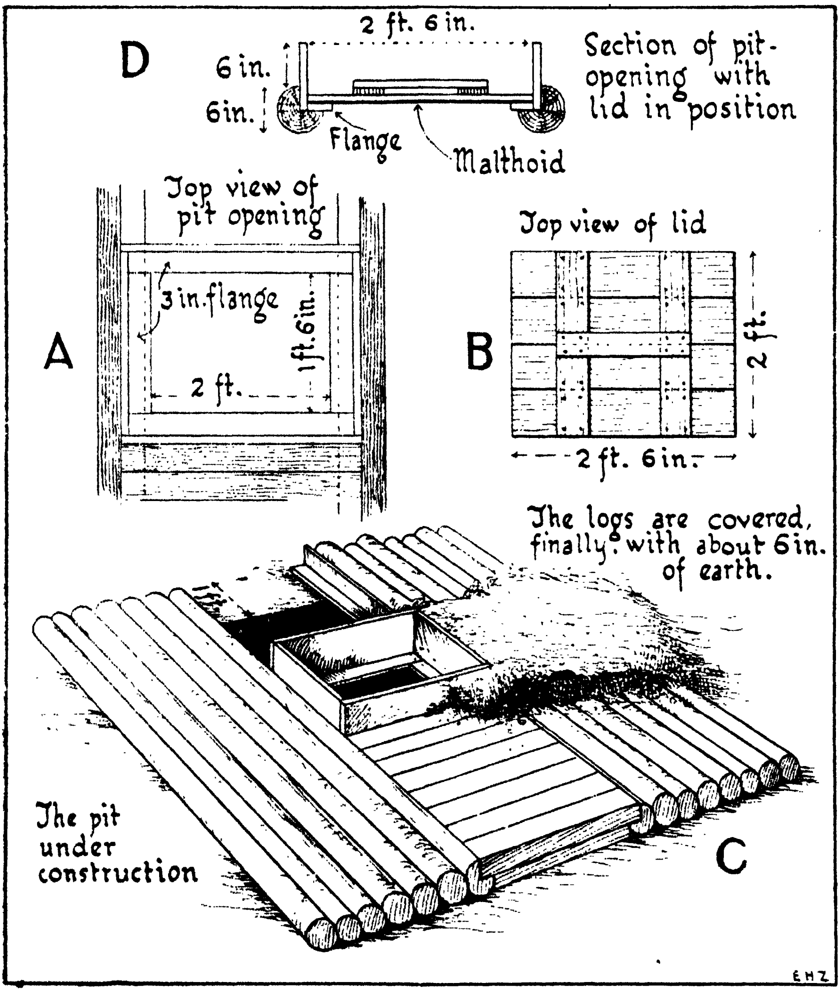

Fig. 2—Another Type of Insect-proof Cover for Waste Fruit Pit.

For a cover of the above dimensions, therefore, the pit, which should have a depth of 6 feet, should be made 6 feet 2 inches long and 5 feet wide. A pit of this size will hold approximately 144 bushels of waste fruit, but the size of the pit and the cover will depend upon the requirements of each orchard. The pit should be dug in a convenient position so that the fruit will not have to be carried any great distance.

Another Type of Cover.

The second type of cover illustrated (see Fig. 2) is designed for a pit measuring 6 feet by 6 feet by 6 feet. The pit is partially covered, as shown (see C), with 6-inch logs about 8 feet long placed closely and parallel to each other, and extending 1 foot beyond the edges of the pit on either side. The two inner logs are rabbeted, and each end of the remaining space is filled with shorter suitable rough timber, leaving a central opening measuring 2 feet by 1 foot 6 inches. Into this opening and projecting 6 inches above the level of the logs is nailed a frame made of hardwood boards 9 inches wide by 1 inch thick, and at the bottom of the opening there is a flange (see A and D) 3 inches wide on which the lid rests when the pit is not being used. If a strip of hessian is tacked on to the flange the lid will rest more evenly and the flies will be prevented from escaping by crawling under the lid. The lid (B) is made of four T and G boards 2 feet long by 6 inches wide and 1 inch thick, fixed closely together and held with two battens nailed on the back. A smaller crosspiece nailed to the battens serves as a handle.

All except the lidded portion of the covering is finally covered with 6 inches of soil well consolidated and extending some distance out from the logs so that if required a cart or lorry may be driven over or backed on to the pit.

"Fertilisers and Crop Production."

During the past twenty years agricultural research workers have been increasingly active in the study of the problems relating to plant nutrition and crop production in all their phases—chemical, physical and biological—and many facts have been added to the available knowledge on these subjects. The increasing number of farmers who desire to study and understand the fundamentals of the use of fertilisers, as well as students in agricultural colleges and high schools, will welcome the issue of "Fertilisers and Crop Production" by Dr. Lucius L. Van Slyke, and published by the Orange Judd Publishing Company of New York—from whom came our copy.

The book is a successor to the author's "Fertilisers and Crops," which has been accorded such marked favour as a text-book since its issue in 1912. It brings the fertiliser subject up-to-date and studies the conditions under which plant foods, whether in the form of soil compounds, farm-produced materials or commercial fertilisers, can be conserved and at the same time utilised with the greatest efficiency and economy in the production of crops. In its scope the book covers: the factors of soil fertility; the functions and physical properties of soils; how plants take their food; the relation of micro-organisms to plant food; the sources and composition of materials used as fertilisers; the selection of fertilising materials and the practical use of fertilisers in growing particular crops.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Sorghum—
White African ... ... Manager, Wollongbar Experiment Farm, Lismore.

Tomatoes—
Bonny Best ... ... Manager, Experiment Farm, Bathurst.
Improved Sunnybrook Earliana ... ... Mr. Albert Sorby, Macquarie Fields.
Marglobe ... ... Mr. S. A. Spicer, "Billabong," Lewis Ponds.
Manager, Experiment Farm, Bathurst.
Norton ... ... Manager, Experiment Farm, Bathurst.

Broom Millet (selected) ... Manager, Experiment Farm, Bathurst.

Cowpea—
Black ... ... Manager, Experiment Farm, Grafton.
New Era ... ... Manager, Experiment Farm, Grafton.

Asparagus—
Connover's Colossal ... Mr. H. Eastwood, Tascott, *via* Woy Woy.
Lady Washington ... Manager, Experiment Farm, Bathurst.

Water-melon—
Angelino ... ... Mr. C. J. Rowcliff, Old Dubbo road, Dubbo.
Grey Monarch ... ... Mr. A. McKim, Bolwarra.
Mr. F. J. Offner, "Mount Olive," Dubbo.

Cucumber—
Early Fortune ... ... Mr. E. Money, Terrigal.
Mr. W. Parry, Terrigal.

Pumpkin—
Banana ("Banana Squash") Mr. F. J. Offner, "Mount Olive," Dubbo.
Queensland Blue ... ... Mr. P. Morandini, Bunglegumbie Road, Dubbo.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

December.

E. HADLINGTON, Poultry Expert.

Keep Only the Profitable Hens.

Because of the reduced returns from poultry farms this year, no poultry-farmer can afford to keep birds which are not laying up to normal expectations. During this month, therefore, a check should be made to see if there are any "drones" among the flocks—particularly among the second-year hens.

The best means of deciding whether any particular pens of birds are not paying is to keep a record of the egg production of each pen for a period of about a week, and where the hens are not laying sufficient eggs to show a profit the reason should be looked for. A reasonable expectation during December, on farms where half the birds are first-year hens, and half second-year, is sixteen eggs per bird for the month, which at present prices should show a profit over cost of feed, provided that a reasonably economical ration is fed. As a guide to those who are not sufficiently experienced to work out the cost of feeding, a few figures showing the position may be helpful.

Based upon a simple, balanced ration, such as is fed on departmental farms, the present cost of feeding amounts to 1½d. per bird per week, *i.e.*, a hundred birds cost 12s. 6d. per week to feed. If the egg production were 50 per cent., 29 dozen eggs would be laid by each 100 birds, and the return approximately 22s. 6d. after deducting marketing charges. This amount, less the cost of feeding (12s. 6d.), would leave 10s. per week from 100 birds. If only 40 per cent. of eggs were laid, the income per 100 birds would be 17s. 6d. per week, leaving a profit over feeding of only 5s., while on a 30 per cent. egg yield the return would be 13s. 1d., which would leave only 7d. profit over feed costs from 100 birds.

Inefficient Management May Cause Reduced Production.

Before proceeding to cull out from the various pens of birds which are not laying a payable number of eggs, consideration should be given to the possibility of errors in management accounting for the poor production. Several causes may be responsible for a poor egg yield which, if removed, would result in a return to normal production. For instance, at this time of the year there may be a heavy infestation of red mite in the houses and nests, particularly among the heavy breeds, and such an occurrence would soon reduce the egg yield. Just recently a case came under notice where the egg yield was not up to expectations and advice was sought in regard to culling out the poor layers. On investigation it was found that the houses were badly infested with red mite; culling was not proceeded with, and spraying was advised, and within a week of the spraying being carried out,

production had returned to normal, having increased by over 100 eggs per day from a flock of 800 birds.

Another reason for a fall in production during the summer months among heavy breeds is the neglect of broody hens. On many farms no satisfactory provision is made for systematically handling the broody hens, and this is responsible for much loss of production. It also renders culling very difficult, because numerous hens which are off in condition most of the time through broodiness, would, if handled properly, come on to lay again in a short time, and perhaps continue for some months; these birds are likely to be rejected as poor layers by the inexperienced.

Overcrowding in the houses is also responsible for great reduction in the number of eggs laid, and still another common cause is a reduction of the feed supply as the birds commence to go off laying, due in some cases to the mistaken idea that the birds may be getting too fat. In either of these cases the result is the same—acceleration of reduced egg supply. It should be borne in mind that the birds at all times should be given as much as they will eat without leaving food lying round.

Advice to the Novice at Culling.

Having determined that culling is necessary, the question that puzzles many poultry-farmers is how to pick out the poor layers, or those which have ceased laying. There are others who look upon culling as a highly technical operation and do not make any attempt to become familiar with the fundamental points, preferring to employ someone to do the work. It should be realised, however, that there is no secret in the art of culling, and anyone who has the aptitude necessary to make a success of poultry-farming should be able to master easily the few main points involved by giving a little study to the matter.

Those who are afraid that they may cull the wrong birds can easily check their judgment by putting the culled birds in a separate pen for a week or so to see if any continue to lay. By doing this it will be seen whether some were off laying temporarily due to having been broody, or to other causes. If this procedure were adopted on more poultry farms, and also a practice made of picking out regularly any birds which were not looking up to "par" and placing them, after giving a dose of Epsom salts, in a pen by themselves, it would be a revelation to many to see the number of birds which were only temporarily off laying, and others which by timely treatment could have been saved. Frequent culling has also the advantage that many poor layers could be disposed of and a considerable saving effected in the feed bill.

The Process of Culling.

When looking through the flock to ascertain which birds should be eliminated, the head of the bird is the surest outward indication of laying ability. The hens which are in full lay are bright and alert in appearance, the comb and wattles are red, soft and pliable. Upon handling, it will be found that the pelvic bones are wide apart, perhaps 1½ to 2 inches or more, and the abdomen soft and full, the skin being also soft and pliable. Those

Fig. 1.

Fig. 2.

Heads of the Good Layers.

Eyes.—Large, bold, prominent and expressive.

Face.—Smooth and free from wrinkles and feathering.

Skull.—Finely modelled and narrow at the base, without overhanging brows.

Comb. Fine in texture.

General appearance indicates activity and alertness.

Fig. 3.

Fig. 4.

Heads of the Poor Layers.

Eyes.—Small and sunken with heavy eyebrows.

Face.—Wrinkled and feathered.

Skull.—Coarse, thick and irregular. Note depth from top of skull to eye and width across head.

Comb.—Coarse in texture, and in the case of the leghorn, thick and "beefy."

General appearance lazy and inactive.

which have ceased to lay appear dull and the comb and wattles may be contracting, resembling a wilting plant, or the comb may have either a white scaly appearance in parts, or be dark on the points of the serrations and blade. In advanced cases the comb may be shrivelled up, and the feathers of the body commencing to fall. The abdomen will be contracted, the skin being wrinkled, coarse and somewhat leathery, and the space between the pelvic bones may be only one finger's width. There are also those which may be off laying temporarily, and in these cases the pelvic bones may be neither wide apart nor close, and there would be some contraction of the skin of the abdomen. Such subjects should be retained for the time being.

The Head Points.

So far we have dealt with picking out the birds which have ceased to lay from those which are still laying—a comparatively simple operation—but more difficulty is usually experienced in deciding between the birds that are not good layers and those which it will pay to keep. As previously mentioned the head is a sure guide as to the productive ability of a hen. The best layers are those which have a fine skull, narrow at the base and showing no sign of overhanging eyebrows, the appearance being alert and active. The poor layer is much broader across the base of the skull and deeper between the eye and the top of the head, the width of the skull causing the eyebrows to overhang, giving the eyes a sunken appearance, and the bird generally conveys the impression of laziness and inactivity.

The eyes of a good layer are large and stand out prominently so that when viewed from the top of the head they can be seen standing out from the line of the face. In the poor layer the eyes are small and sunken.

The face is also a means of distinguishing between the good and bad layers. Prolific layers will be found to be free of wrinkles and feathering, and the face somewhat long and deep, yet well proportioned, while the "drones" will be wrinkled and feathery, indicating coarseness. The texture of comb and wattles together with their thickness should also be taken into consideration. A fairly fine comb, free from coarse graining, is looked for in the good layer, whereas the inferior layers may be rough grained, thick and heavy.

Figs. 1 to 4 convey a good idea of the differences in the points outlined.

Body Conformation.

In addition to the head points the body conformation should be taken into consideration. For a bird to be capable of high production the body should be fairly long, broad and deep (Figs. 5 and 7), without being unduly heavy (an indication of coarseness, as in Figs. 6 and 8), whereas the narrow-bodied bird lacks the constitution to stand up to high production (Fig. 9). The width of the bird should be measured across the back and the depth taken from the top of the back to underneath the body between the legs.

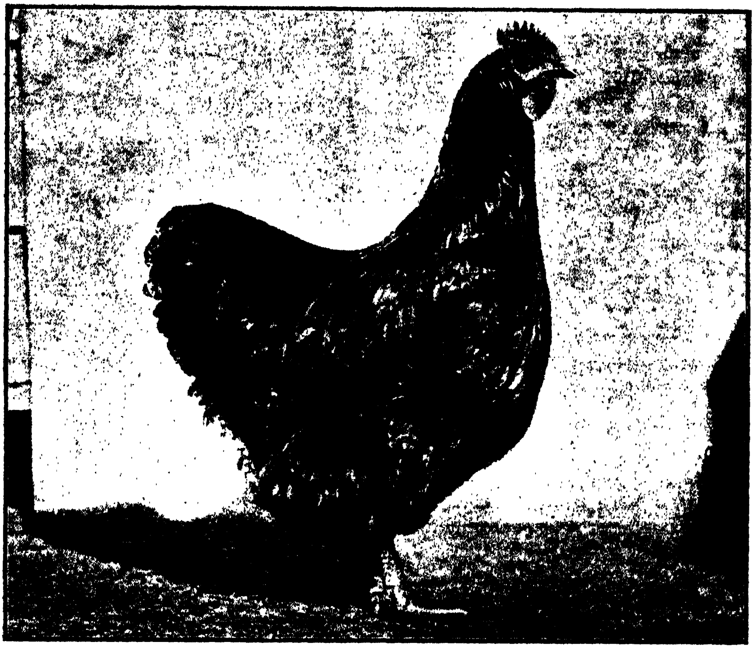

Fig. 5.—Good Layer.

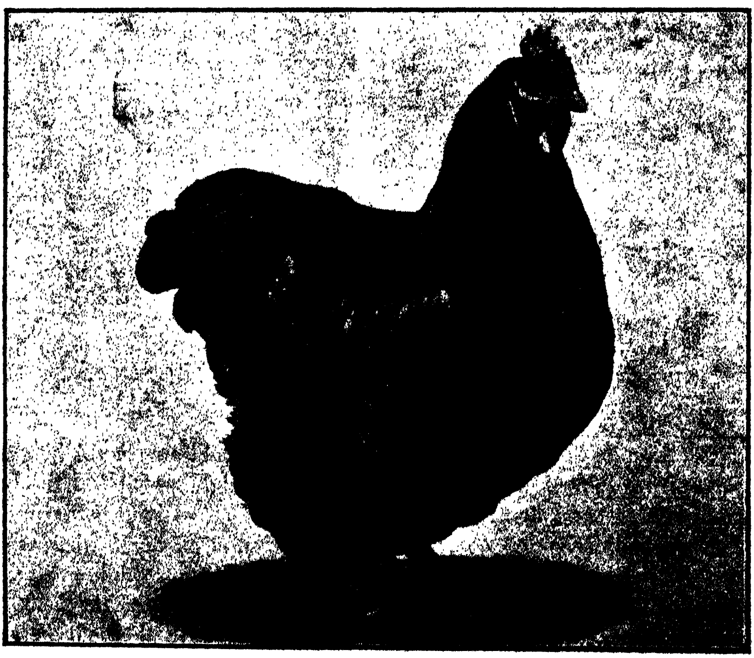

Fig. 6.—Poor Layer.

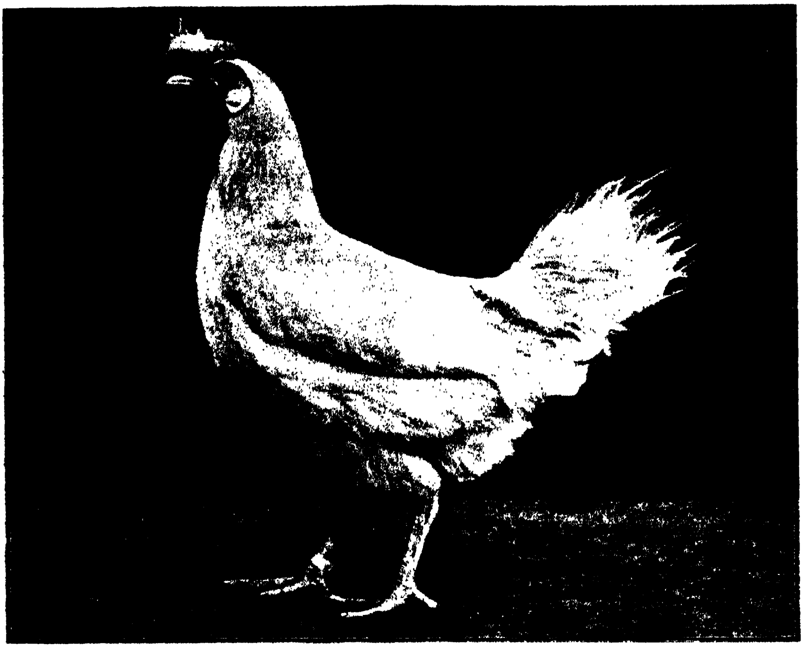

Fig. 7.—Good Layer.

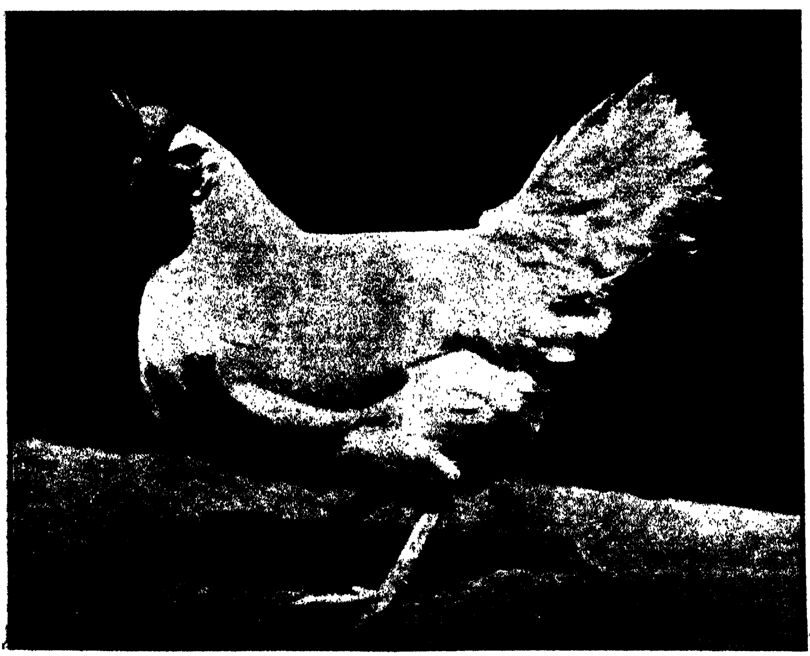

Fig. 8.—Poor Layer.

Pelvic Bone Formation.

Generally speaking, birds having coarse heads and sunken eyes will be found to be coarse in other respects, such as excessively thick in the legs, and the pelvic bones are usually thick and gristly, whereas the fine-headed birds are the reverse.

Too much reliance should not, however, be placed upon pelvic bone tests in choosing between the good and bad layers, as it frequently happens that some of the best layers do not show great width between the pelvic bones nor are they necessarily very fine. It should also be borne in mind that the width between these bones is governed by the condition of the birds. For instance, a bird in full lay would show much greater width than the same

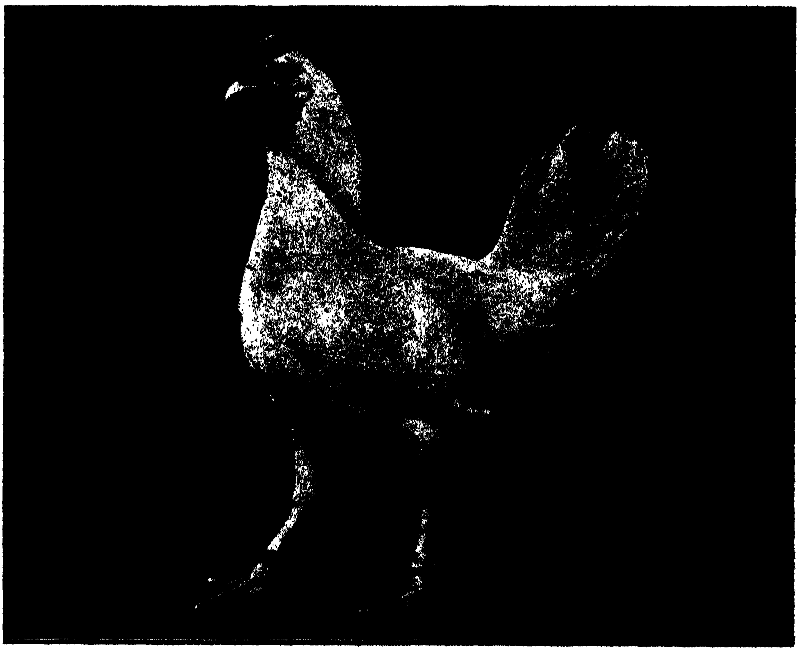

Fig. 9.—White Leghorn (Poor Type).

A weak degenerate type of fowl. Insignificant in appearance. Eyes are small—face hollow and feathered. This is a type that would produce small eggs and would be incapable of high egg production. Usually is the progeny of degenerate breeding stock but may also result from faulty rearing.

bird would after she ceased laying temporarily, and when moulting the bones would be quite close together. So that while the space between the pelvic bones is an indication as to whether a bird is laying or not, it should not be taken as a reliable guide for determining which is a good or a bad layer.

Weaklings.

In the course of culling, attention should be paid to birds of poor physique, as illustrated in Fig. 9. Such birds may pay during the first flush season of laying, but would certainly not be profitable to carry over a

second year. These birds are often the result of bad rearing or of hatching late in the season, but where they occur in numbers throughout the main hatching season some weakness may be looked for in the breeding stock.

Culling First-year Hens and Pullets.

Under present conditions a more rigid culling may be necessary among first-year hens, and those which should be eliminated are birds of poor physique or showing a decided tendency towards coarseness; also any which break into a moult during this month or next.

As far as the pullets are concerned, there should be no necessity for extensive culling among well reared birds, and action should be restricted towards picking out any deformed specimens or others showing pronounced coarseness or extreme weediness. No attempt, however, should be made at culling pullets until they are over six months old, other than for deformities, etc., because until the birds are matured, it is easy to make mistakes and reject potentially good layers.

Germination Test of Wattle Seed.

Recently a sample of Cootamundra wattle (*Acacia Baileyana*) seed was received from a correspondent with a request that germination tests be conducted in order to ascertain the best method of seed treatment for promoting rapid and effective germination. The following tests were carried out in a seed incubator where the temperature is controlled at 30 deg. Cent.:—

1. Seed untreated.
2. Seed soaked in cold water for 30 minutes.
3. Seed placed in cold water and water brought to boiling point.
4. Water brought to boiling point, seed immersed and allowed to remain for 10 minutes with heat turned off.
5. Seed placed in boiling water and boiling continued for 10 minutes.

The results are shown in the following table:—

Test No.	Germinating Energy in Days— 11	20	34	Total Germination.	Non-germinable Seeds.
	per cent.	per cent.	per cent.	per cent.	per cent.
1	4	4	4	4	96
2	4	4	4	4	96
3	48	84	88	88	12
4	40	92	92	92	8
5	60	84	84	84	16

These figures indicate that intense heat is required to soften the hard outer seed coat of wattle seed, and explain why large numbers of young wattle plants appear after a bush fire.—Amy Myers and Dulcie Liels, Seed Testers.

Tobacco Notes for December.

C. J. TREGENNA, Tobacco Expert.

In last month's Notes the subject of transplanting was discussed at length, and growers who are only now undertaking this work should refer to last issue.

Cultivation.

Tobacco responds well to cultivation, and the grower should aim at keeping his land in fine tilth, and free from all weeds up to the time the plants are ripening so that excessive evaporation of moisture is avoided. The root system of the tobacco plant is largely near the surface, and for that reason shallow cultivation must be practised. As soon as a crust is formed, or the ground becomes hard, get to work with the horse cultivator and hoe, and when the plants are high enough, arrange the tines of the cultivator so that the earth is gradually drawn from between the rows towards the crown of the plants. Pronounced ridging will induce the drying-out of the soil, and should be avoided.

Generally the crop should receive a thorough cultivation every week or ten days after the plants have started growing until such time as the horse cultivator cannot be used without damaging the leaves of the plants owing to their size.

Where irrigation is practised, cultivation must be carried out as soon as the ground begins to harden or crust. It is useless to water alone if good results are expected.

The bottom leaves, generally numbering from four to six, almost invariably become damaged and dirty, and should be removed. The sap will then be taken up by the leaves well off the ground.

Growing of Cowpeas with Maize.

A method of utilising cowpeas that has much to recommend it is to plant them between the rows of early-sown maize after the last cultivation, which should be carried out about tasselling time. Maize planted early in September will tassel during November, by which time the soil is warm, and provided sufficient moisture is present no difficulty will be met in obtaining a good stand of cowpeas. A corn-dropper fitted with a suitable plate can be used to advantage for planting. The cowpeas will make the bulk of their growth after the maize has commenced to ripen off, and therefore will not usually affect the yield of the latter crop.

For this purpose it is advisable to choose a quick-growing variety, such as New Era. After removal of the maize the cowpeas and residues may be grazed or ploughed under immediately if it is intended to follow on with an autumn-planted crop.

A pamphlet on the production of cowpeas is obtainable free on application to the Department.

Orchard Notes.

DECEMBER.

C. G. SAVAGE AND R. J. BENTON.

THIS month usually ushers in weather of a definitely summery character, hastening the harvest of fruit of many kinds. Peaches, midseason and late-ripening apricots, plums, early apples, also Late Valencia oranges in many localities, will all be demanding attention with a view to marketing. As many recent references have indicated, there promises to be a large supply of fruit of every sort, and the grower is advised to be careful in grading and packing, and to market only such quality as is in demand; also to keep in close touch with his distributor. If the latter is advised of anticipated quantities and qualities available for distribution, it will be to the benefit of both parties.

The spring months have been more favourable than usual to a reserve of soil moisture. The ultimate size attained by the fruit is mainly dependent upon there being a sufficient supply, and cultivation as necessity arises to keep down weed growth must therefore not be neglected. Under irrigation the stirring of the soil is necessary also to assist in the penetration of the water. The surface drains of orchards on hillside situations must be regularly attended to in order that minimum erosion may be caused by thunderstorms.

Planting of Passion Fruit.

Planting of passion vines may be continued this month. It is advisable to give each of the young plants a quart of water, and to reduce the leaf area by cutting them back. It is frequently noticed that growers commence to train the plants too early, often endeavoring to get the original stem to form the main trunk. Pinching of laterals to this end entails considerable labour and gives poor results. Training should not commence until there are several vigorous laterals, 18 inches long at least. One or two of these should be selected and tied to a stake and the remainder of the plant cut off, and any side shoots arising from the plant should be removed until the wires are reached. The leaves should not be removed from the stem, as they shade the vine and help in its development during the period of training.

Where passion vines have been pruned in recent weeks or are being newly trained, applications of Bordeaux mixture (6-4-50) at monthly intervals is recommended for prevention of brown spot.

Reworking of Citrus Trees.

Where citrus trees were cut back in early spring for re-working considerable vigorous growth should now be in evidence. In localities where winter frosts are not severe and the growths are thick enough, buds may now be inserted and the stock cut to a few inches above the bud in about two or

three weeks' time. In most cases, however, budding in late February or March is recommended, the shoots budded being not cut back until next spring. In all cases trees cut back some months ago will need some attention in the way of the thinning out of unnecessary growths and a light checking of any growth so exuberant that there is a risk of it being broken off. From eight to sixteen shoots are usually required for budding later according to the size of the tree.

Lemons.

The production of high quality lemons is essential if the product is to demand the attention of the best trade. While there is no fault to be found with the juice content of the average sample, improvement is possible in the keeping quality and in appearance and size. Size and keeping quality depend on soil and cultural factors, but appearance, while indirectly due to such factors, may be further improved by increasing the proportion of fruit grown in the shade. To this end occasional shortening of any long straggling laterals to induce a denser growth is recommended. Mr. Inspector Griffen finds that two prunings a year, and sometimes three, are necessary for the best results.

Though data as to fruit harvested during the various seasons of the year are not complete, it appears certain that better quality fruit is being produced by lemon trees receiving applications of nitrogenous fertiliser in midsummer and early autumn than in the spring and early summer.

Thinning of Apples and Pears.

With some varieties of apples and pears it will be necessary in many cases this season to thin out a portion of the fruit if the crop is to develop to a satisfactory commercial size. The chief advantages of thinning are as follows:—

1. It lightens the overloaded tree, and the remaining fruit has a much better chance of attaining a good commercial size and commanding better prices.

2. The handling costs are less.

3. It gets rid of undesirable specimens of fruit to the advantage of better specimens.

4. It assists in regulating crops of marketable fruit.

5. Spraying can be more thoroughly carried out, and as a consequence is more effective.

To quote a Canadian departmental publication on this subject: "There is much experimental evidence to show that thinning judiciously done rarely reduces the total volume of apples produced. It simply makes it possible to grow one good apple in place of probably two inferior ones. The reduction in the number of fruits from thinning means that proportionately less apples are to be harvested when matured, and that a saving of labour in picking and packing is thereby effected."

Many varieties of apples and pears require thinning only in exceptional circumstances: it is more frequently beneficial, on the other hand, in the case of apples which bear in clusters, such as Yates and Rokewood, and pears such as Beurre de Capiaumont and Winter Cole. The operation should not be started until the fruit has set well, and after natural shedding has taken place. When thinning, care should be taken to space the fruit and remove any fruit which is malformed or badly blemished.

Growers would be well advised to inspect all young trees and remove any fruit which is likely to retard their development. A few apples or pears on young trees may be responsible for the breaking or bending of limbs which have not developed sufficiently to carry the weight of fruit, and the amount of fruit harvested from such trees is extremely poor compensation for the damage done. It is most desirable that trees should be properly developed before they are allowed to carry fruit.

Control of Soil Erosion in Orchards.

Mr. W. W. Cooke, Fruit Instructor at Goulburn, has drawn attention to the fact that soil erosion is becoming a matter causing grave concern in many orchards, and has supplied the following notes in regard to the influence of cultural practices on the washing of orchard soils.

In some instances, he observes, the annual amount of soil lost is so small as to be hardly noticeable, though sufficient in time to affect the health of the trees and the amount and quality of the fruit produced. In other instances the loss after one storm may be so great that weeks of work may be required to cart back the soil that has been washed to lower parts of the orchard, whilst in others again much valuable soil may be totally lost. Clean cultivation when the orchard has been planted on a slope is largely to blame for this loss, especially with some types of soil. Yet clean cultivation is necessary from about October to March in order to conserve soil moisture, for whilst the theory that cultivation locks in the moisture by stopping capillary movement has been largely abandoned, it is recognised that it is essential to destroy weed growth if the moisture in the soil is to be retained. It has been estimated that as much as 300 to 500 lb. of water are required to produce 1 lb. of dry vegetable matter, most of this water being removed from the soil by transpiration. Nor must the important part a soil mulch plays in keeping the feeding roots of trees cool during a hot summer be lost sight off. It has been found that in cultivated soil the temperature at a depth of a few inches is many degrees cooler than at the same depth in a soil not cultivated. It thus appears impossible to avoid clean cultivation if the best results are to be obtained. The question then arises how to prevent soil erosion, whilst still giving the orchard the cultivation necessary to promote the required growth of both trees and fruit.

Various methods have been adopted by fruit-growers in southern New South Wales, with more or less satisfactory results. In one orchard visited ploughing up and down the slope has been abandoned in favour of cross-ploughing, and a strip of soil 12 or 14 inches wide is left unploughed along

each row of trees. Whilst this makes the work harder for the ploughman, and has a somewhat untidy appearance, it has prevented an enormous loss of soil. Most of the cultivation is also done across the slope. In several other orchards every third or fourth row of trees has a strip left uncultivated.

Whilst this method gives good results with land having an even slope, other methods must be adopted where the contour of the land is more or less broken. In some orchards contour drains are used, these being made in the form of shallow open drains 3 to 4 feet wide following the contour of the land and of only sufficient depth to carry off storm water. In some cases these are sown down with grass, to prevent erosion in the bottom of the drains. Care then has to be taken in crossing them with the plough, etc., so as not to destroy them. The conformation of some orchard land makes it necessary for several contour drains to lead into a depression, running more or less downhill. It then becomes essential for the latter to be sown down with some suitable grass, and left uncultivated. Whilst these methods may appear to some to entail considerable trouble, those who have tried them consider the benefits more than compensate for any difficulties encountered.

In orchards where the erosion is only slight, much can be done by exercising care in cultivation. In parts where erosion is likely to occur, it is not desirable to work up the soil to too fine a tilth, thus encouraging loss of soil; neither is this absolutely necessary to conserve moisture. It is also advisable when two cultivations are given with little or no interval that the last should be across the fall of the land, and not up and down. Although there are unfortunately some orchards where it is almost impossible to prevent some loss of soil, very much can be done with some or all of the methods suggested to reduce such loss to a minimum.

Students Desirous of Gaining Farm and Station Experience.

A NUMBER of students, who will have completed the Hawkesbury Agricultural College Diploma Course in Agriculture at the end of the year, desire to gain further practical experience on farms and stations. These lads, about 19 to 21 years of age, have obtained a thorough grounding in agriculture during the three years' course and can be recommended. Should any farmer or pastoralist desire to obtain the services of any of these lads he should communicate with the Principal, Hawkesbury Agricultural College, Richmond.

Also, during the midsummer vacation (15th December, 1932, to 29th January, 1933, inclusive), certain of the College students are anxious to gain practical experience on approved farms. These students are from about 17 to 20 years of age, and the Principal would be pleased to hear from any farmer or grazier who is able to place one or more of these students.

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